AN INVESTIGATION OF THE RELATIONSHIPS BETWEEN MEMORY STRATEGIES, PERFORMANCE ANXIETY, AND MEMORY LAPSES AMONG CLASSICAL PIANISTS

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Unlike most other musicians, pianists need to play by memory during their recitals, juries, etc. Doing so can greatly influence the intensity and frequency of anxiety due to potential memory slips when performing. The purpose of this study is to examine the relationship between memory strategies, experiences with memory lapses, and performance anxiety among classical pianists. The specific aims of the study are to: (1) characterize demographics, performance practices, and memorization strategies used by college-level pianists; (2) assess experiences of performance anxiety and the influence of performance anxiety on memory lapses; (3) examine the relationships between demographics, performance practices, and memorization strategies; and (4) suggest various memorization strategies that might be useful intervention to overcome memory lapses. To examine participants' awareness and perception, a survey was conducted via invitation of participation from music schools and piano groups on social media, and the useable collected data came from 162 respondents. The results disclosed that pianists' awareness of memory strategies and performance anxiety were significantly correlated. It showed a relationship between knowledge of memory strategies and frequency of performance anxiety within their musical experiences.

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CHAPTER 1

INTRODUCTION

Managing complicated mental processing of music is a challenge for performers.[1] However, unlike most other musicians, pianists are required to perform by memory during their recitals, juries, competitions, and auditions. In addition to being a tradition for classical pianists, playing by memory reduces the need for numerous page-turns while performing. While potentially beneficial, playing by memory can greatly influence the intensity and frequency of performance anxiety due to potential memory slips when performing. Playing by memory may induce performance anxiety due to both the evaluative nature of piano performances and concerns for memory lapses.[2] Among pianists, this potentially crippling consequence may appear suddenly or develop gradually in response to an impending and important concert, audition, or competition. The association between anxiety and memory lapses may be related to how a pianist learns to memorize a piece of music.

1.1 Memorization for Pianists

One of the earliest known pianists to play from memory was Clara Schumann, who played Beethoven's Piano Sonata No. 23 in F minor, opus 57 in 1837.[3] Performing by memory was not a common practice until the middle of the nineteenth century, because performing a composer's work without a score was considered inappropriate behavior or an act of pretentiousness against the audience.[4] Performing without a score in the nineteenth century was

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[1] Inette Swart and Caroline van Niekert, "Trauma-Related Dissociation as a Factor Affecting Musicians' Memory for Music: Some Possible Solutions," *Australian Journal of Music Education* 12 no. 2 (June 2010): 117.

[2] Aaron Williamon, "The Value of Performing from Memory," *Psychology of Music* 27 no. 1 (April 1999): 84

[3] Joan Chissell, *Clara Schumann: A Dedicated Spirit: A Study of Her Life and Work* (New York: Taplinger Publishing Company, 1983), 46-47.

[4] Harold C. Schonberg, *The Great Pianists* (New York: Simon and Schuster, 1963), 238,

often regarded as conceited because it seemed to change the audience's focus toward the pianist's performance and away from the composer.[5] In 1841, Franz Liszt performed Bach's Chromatic Fantasy and Fugue in D minor, BWV 903 and some Organ Preludes and Fugues, Beethoven's Piano Sonata, No. 23 in F minor, opus 57 and No. 29 in B-flat major, opus 106, as well as his own piano transcription pieces from memory during his ten-week Berlin sojourn.[6] Performing from memory and with romantic virtuosity became desirable, and this type of performance practice began to inspire admiration. In addition, traditional teaching methods started to encourage students to learn pieces by memory in order to develop interpretive skills.[7] For pianists, there was an advantage of playing by memory because they did not have to focus on the scores and therefore, they were able to focus on their own sound, sensitively, and ultimately be freer physically thereby broadening the breadth of musical expression. Playing by memory can also influence pianists' confidence and the mental freedom that comes from knowing the score completely.

However, the experience of having to memorize classical music and then perform by memory can be extremely difficult, time consuming, and psychologically stressful. Even for pianists who found memorizing easy when they were young may find it more difficult as they advance due to an increase in the number of pieces performed on one recital and the continued expectation to expand their repertoire. Memorization also requires more practice time and effort. Plus, there is always the potential for unexpected situations to occur while performing on stage that can distract or influence the ability to stay focused. Because performing by memory is

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[5] Jennifer Mishra, "A Century of Memorization Pedagogy," *Journal of Historical Research in Music Education* 32, no. 1 (October 2010): 3.

[6] Alan Walker, *Franz Liszt: The Virtuoso Years 1811-1847* (New York: Cornell University Press, 1987), 371-372.

[7] Mishra, "A Century of Memorization Pedagogy," 3.

difficult and an expected skill by classical pianists, focusing on how pianists successfully approach this challenge might be informative and highly relevant to piano pedagogy.

1.2 Multiple Memory Systems

Many teachers have discussed what they believe are successful memorization approaches on behalf of piano students. Jennifer Mishra published an article titled; “A Theoretical Model of Musical Memorization,” and explained that early researchers mostly focused on efficient memorization procedures through the lens of case studies and recorded/written interviews rather than explorative goals as an approach to examine and understand how memorizing works.[8] Mishra also introduces three stages of memorizing for performance as shown in Figure 1.1. These stages move from preview, to practice, and then to over-learning sections. The preview stage is subdivided into performance overview, notational overview, and aural overview while the practice stage is subdivided into conscious memorization and notation-based practice/incidental memorization. The over-learning stage is divided into auto memorization, re-learning, maintenance, and additional motivations.[9] She also suggests that musician can decide to expand or ignore some stages or divide then more specifically.

In one of the chapters of the *Oxford Handbook of Music Psychology,* David Rubin presents multiple memory systems that seems to overlap with Figure 1.1. He suggests that performers explore many distinctive physical and cognitive systems contained in action that bring about their own memory paths and codification of mental experience.[10] Rubin also

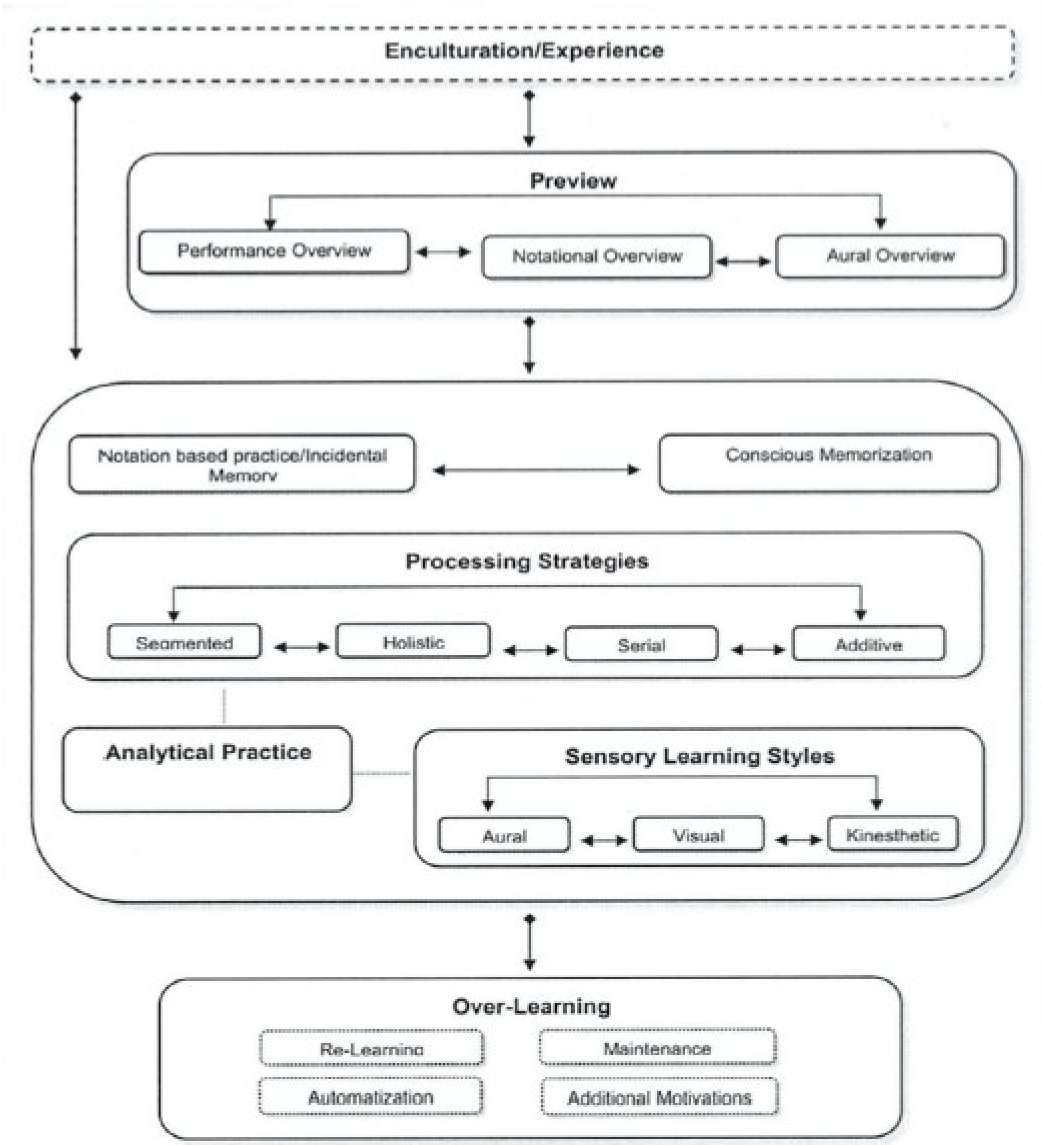
[8] Jennifer Mishra, “A Theoretical Model of Musical Memorization,” *Psychomusicology: Music, Mind, and Brain,* 19 (Spring 2005): 75.

[9] Ibid., 76.

[10] Roger Chaffin, Topher R. Logan, and Kristen T. Begosh, “Performing from Memory,” in *The Oxford Handbook of Music Psychology,* ed. Susan Hallam, Ian Cross, and Michael Thaut (New York: Oxford University Press, 2009), 354.

suggested that multiple memory systems (including motor, visual, auditory, structural, linguistic, and emotional memory) relate to music performance.[11]

Figure 1.1: A model of how music is memorized for performance [12]



Motor memory is suggested to occur automatically by delivering sensitive kinesthetic feedback from muscles, joints, and finger touches to the brain. Pianists consider motor memory

[11] David C. Rubin, "The Basic-Systems Model of Episodic Memory," *Perspectives on Psychology Science,* 1, no. 4 (December 2006): 281-286.

[12] Jennifer Mishra, "A Theoretical Model of Musical Memorization," 77.

as being 'in the hands' and suggest a form of muscle memory for pianists. Motor memory is also an example of connective sequencing in memory where each procedure in the series cues the next. The more pianists practice, the more they can access motor memory.[13]

Visual memory seems to be helpful in the early stages of memorizing. In their book, *Practicing Perfection: Memory and Piano Performance*, Roger Chaffin, Gabriela Imreh, and Mary Crawford discuss visual memory of the score. However, they describe the difficulty some performers have when practicing with a different edition of a score than what they used when learning the piece.[14] A new score is hard to work with since the visual information is different from the performer's visual memory. Remembering the spot of a passage on the score may become a routine arranging of spatial imagery. Some music major students often employ the spatial imagery of music by pages instead of the structure of the piece to arrange their practice.[15] However, some pianists have argued that visual memory has some drawbacks and is unhelpful for them because visual memory can be acceptable for some passages that lay well under the fingers, but for pieces that include wide leaping intervals, the eyes will be likely consciously focused on the distance on the piano. This will lead to annoyance for some pianists who play certain passages from a mental memory of the printed music.[16]

Auditory memory can remind the performer of what comes next by offering cues to guide the music from memory.[17] Psychologists have researched this ability in people with or without

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[13] Chaffin, Logan, and Begosh, *The Oxford Handbook of Music Psychology*, 355.

[14] Roger Chaffin, Gabriela Imreh, and Mary Crawford, *Practicing Perfection: Memory and Piano Performance* (New York: Psychology Press, 2002), 37.

[15] Chaffin, Logan, and Begosh, *The Oxford Handbook of Music Psychology*, 356.

[16] Kendall Taylor, *Principles of Piano Technique and Interpretation,* (Great Britain: Novello, 1981), 155.

[17] Chaffin, Logan, and Begosh, *The Oxford Handbook of Music Psychology*, 355.

musical education in order to define the form in which the auditory data is saved.[18] These studies suggest that some can 'hear' melodic lines in their heads without the need to follow imagery from other modalities showing the basis of separate auditory memory.[19] Auditory memory also seems to contain information about pitch category (perception of pitch) and pitch contour (relative pitch) since people seldom remember a piece in the same key signature as the original.[20]

Another type of memory is linguistic memory that could remind performers what to do during a performance. Linguistic memory does not need to include words because linguistic memory is considered as an abstract 'subject-presuppose' form which is usually detailed, in contrast to other memory types. Psychologists believe that linguistic memory could be explained in words such as 'Now, like this' or 'Hold back'.[21]

> An important characteristic of linguistic memories is that they can be rehearsed in working memory, where they can serve to direct other mental processes. When the activity of other cognitive systems is re-described in language, the inner speech that results provides a means of mental control that can be used of implement plans and strategies. Rehearsing a mental instruction in working memory broadcasts it throughout the nervous system, automatically activating other systems and coordinating their activity.[22]

Emotional memory is an important instrument for communicating emotions. This strategy can bring out memories under connective mechanisms. Because positive influences of emotion on memory can be interrupted by damage to neural areas contained in emotion, it seems clear that the performer's visceral response to the music can provide musical memory. Studies have found

[18] Andrea R. Halpern, "Musical Aspects of Auditory Imagery," in *Auditory Imagery,* ed. Daniel Reisberg (New York: Psychology Press, 1992), 22.

[19] Daniel Reisberg, *Cognition: Exploring the Science of the Mind*, (New York: W.W Norton & Company, 2012), 373-374.

[20] W. Jay Dowling, "Scale and Contour: Two Components of a Theory of Memory for Melodies," *Psychological Review* 85, no. 4 (1978): 342.

[21] Chaffin, Logan, and Begosh, *The Oxford Handbook of Music Psychology*, 357.

[22] Ibid., 357.

that musicians find it hard to perform from memory without expression, and hypothesize that performing without expression ends emotional signals, which come with the retrieval of the music from memory.[23] William Aube, Isabelle Peretz, and Jorge L. Armony conducted three case studies to research the effect of emotions (fear, sadness, and happiness) on identification memory for music. They used short, unfamiliar music sections for the research and compared these with non-linguistic melodies. The results demonstrated better memory precision for musical expression of fear and, to some extent, happiness.[24]

Structural memory is memory based on consecutive organization. Memories are arranged by schemas that join temporal sequences over narrative structures on the basis of the goals of the performers involved. These structures seem to be reliable for music by allowing for recall of sections and subsections in terms of harmonic, melodic, and metrical structures. In practicing a piece, musicians may analyze those structural spaces and arrange their practice and memory.[25]

1.3 Performance Anxiety for Pianists

Performance anxiety exists in many different contexts, such as sports, performing arts, public speaking, and even academics. Music performance anxiety is a unique form of performance anxiety that concerns many musicians around the world. The level of performance anxiety and related symptoms may happen before, during, and after playing music[26] and can occur suddenly or progress slowly over time before any audition, competition, or recital. The debilitating nature of these experiences can be severe enough that it becomes the reason for a

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[23] Chaffin, Logan, and Begosh, *The Oxford Handbook of Music Psychology*, 356.

[24] William Aube, Isabelle Peretz, and Jorge L. Armony, "Effects of Emotion on Memory for Music and Vocalisations," *Memory* 21, no. 8 (2013): 981.

[25] Chaffin, Logan, and Begosh, *The Oxford Handbook of Music Psychology*, 356.

[26] Laura A. Clevenger, "A Study of the Correlation Between Mindfulness. . . Education" (PhD diss., Capella University, 2015), 1-2.

musician to quit his or her job.[27] The most obvious problem related to experiencing music performance anxiety is that it can bring about a negative consequence on the quality of the performance. Unlike other instrument specific groups, pianists are required to perform by memory, and seemingly therefore more likely to experience debilitating performance anxiety. Musicians who experience performance anxiety may have symptoms such as trembling, fear, dry mouth, a rapid heartbeat, cold hands, sweating, loss of concentration, muscle tension, and paleness.[28] Some musicians also experience a lack of appetite, sleeplessness, and even a stomach ache.[29]

When preparing to perform by memory, pianists must focus on remembering tempo, harmonic changes, various dynamics and related touches, musical phrasing, and sound tones so they can perform without a musical score. In addition, they have to consider the potential need for modifying their performance technique in order to accommodate the conditions of a performance venue or an instrument that is different from what they routinely practiced on every day.[30] Classical pianists have to practice with concentration in order to feel at ease during a performance. However, they may think that small errors can ruin their concert or remove their sense of control during a recital.[31] Pianists may have even more pressure and anxiety once they make small mistakes because of the lack of music scores on stage.

While some pianists believe that performance anxiety gives way to negative

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[27] Raducanu Cristina Andra, "Performance Anxiety in Piano Playing" (Paper presentation, the 11th WSEAS International Conference on Acoustic & Music: Theory & Applications, Iasi, Romania, June 13-15, 2010), 1.

[28] Paul M. Lehrer, "A Review of the Approaches to the Management of Tension and Stage Fright in Music Performance," *Journal of Research in Music Education* 35, no. 3 (Autumn 1987): 146-148.

[29] Dale Reubart, *Anxiety and Musical Performance: On Playing the Piano from Memory* (New York: Da Capo Press, 1985), 7.

[30] Andra, "Performance Anxiety in Piano Playing," 2.

[31] Andra, "Performance Anxiety in Piano Playing," 2.

consequences, it is potentially facilitative as described in an article "Music's Performance Anxiety and Coping Strategies" Sang-Hi Lee who states:

> Psychologists have labeled a type of heightened state of arousal as a biologically based, motivating force D. L. Hamman's studies showed that musicians with the highest level of formal training were able to use the anxiety factor for positive performance effect. Wolfe similarly learned that professional musicians used the positive anxiety components, such as arousal and intensity, to promote performance rather than letting the negative elements, like apprehension and distractibility, diminish performance quality.32

Some musicians do benefit from music performance anxiety, and that self-confidence seems to influence the type of positive response. Staci Miller and Kris Chesky published an article titled "The Multidimensional Anxiety Theory: An Assessment of and Relationships Between Intensity and Direction of Cognitive Anxiety, Somatic Anxiety, and Self-Confidence over Multiple Performance Requirements among College Music Majors." They explained that performance anxiety can lead to a positive influence on playing even though most researchers have focused on performance anxiety as something negative.[33] Miller and Chesky conducted a study to; research the multidimensional anxiety theory; the results demonstrated that higher cognitive intensity was associated with lesser self-confidence.[34] Some musicians consider anxiety as advantageous by remapping their mental skills.[35] Nabeel Zuhdi's study also explores how performance anxiety (an average level of stress/anxiety) can be a positive influence that stimulates musicians performing their best and having self-confidence.[36]

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[32] Sang-Hie Lee, "Musician's Performance Anxiety and Coping Strategies," *The American Music Teacher* 52, no. 1 (August/September 2002): 38-39.

[33] Staci Renee Miller and Kris Chesky, "The Multidimensional Anxiety Theory: An Assessment of and Relationships Between Intensity and Direction of Cognitive Anxiety, Somatic Anxiety, and Self-Confidence over Multiple Performance Requirements among College Music Majors," *Medical Problems of Performing Artists* 19 no. 1 (March 2004): 12

[34] Ibid., 18.

[35] Margaret S Osborne, Don J Greene, and Don T Immel, "Managing Performance Anxiety and Improving Mental Skills in Conservatoire Students Through Performance Psychology Training: A Pilot Study," *Psychology of Well-Being: Theory, Research and Practice* 4, no. 18 (December 2014): 3.

[36] Nabeel Zuhdi, Kris Chesky, Sajid Surve, and Yein Lee, "Occupational Health Problems of Classical Guitarists,"

As noted in the above research on positive performance anxiety, some anxiety and nervousness can be a boost to musicians' state of mind, leading to a better quality of performance.

Unfortunately, the research literature provides little insight regarding how classical pianists memorize music, related influences on performance anxiety, and related experiences with performance anxiety-related memory lapses. This dissertation explores these issues by surveying high-level classical pianists in order to better understand how they memorize music, the extent that pianists experience performance anxiety, and the potential relationships between memorization strategies used, experiences with performance anxiety, and memory lapses.

1.4 Purpose of This Study

The purpose of this study is to examine the relationship between memory strategies, experiences with memory lapses, and performance anxiety among classical pianists. The specific aims of the study are to 1) characterize demographics, performances practices, and memorization strategies used by classical pianists, 2) assess experience with performance anxiety and the influence of performance anxiety on memory lapses, 3) examine the relationships between demographics, performances practices, and memorization strategies, and 4) and suggest various memorization strategies that might be useful intervention to overcome memory lapses.

Medical Problems of Performing Artists 35, no. 3 (September 2020): 176.

CHAPTER 2

METHOD

2.1 Data Collection

This study used a survey approach for collecting data from a convenient sample of classical pianists. A survey was posted on Qualtrics software and was made available to college-level piano major students, professors of piano, and professional pianists who are associated with a music school. Following approval by the UNT Institutional Review Board (IRB), email invitations were sent to piano faculty working in schools of music that are accredited by the National Association of School of Music (NASM). The invitations encouraged professors to take part in a survey and to pass on the announcement to their colleagues and piano major students. Emails were sent to approximately 539 faculty in 165 schools of music and the survey was active from April to December of 2020. The announcement was also posted on piano-related social media groups (such as Facebook) asking members to take the survey.

2.2 Questionnaire Development

The survey questionnaire consisted of the five sections of demographics, musical background, music memorization awareness, memory lapses, performance anxiety, and Competitive State Anxiety Inventory-2 (CSAI-2.)

The demographics and musical background questions included gender, age, ethnicity, number of years of playing piano, practicing hours per week, teaching hours per week, number of public performances, and educational background.

Based on the literature of Jennifer Mishra's and David Rubin's studies, a total of 28 questions for measuring key variables of memorization awareness, memory lapses, and performance anxiety were designed to ask what types of memorizations to use, which memory types are useful or not useful, practice habits, the experience of memory lapses, the experience of performance anxiety, frequency of performance anxiety, and influences between performance anxiety and memorizing music.

Answers to questions included multiple choice options or digital visual analogue scale (VAS) sliders that asked subjects to scroll the cursor to indicate their answers. The VAS scales ranged from: *weak* (0) to *strong* (100), *very little* (0) to *very much* (100), *not at all* (0) to *a lot* (100), *rarely* (0) to *frequently* (100), *never* (0) to *always* (100), *negative influence* (-50) to *not at all* (0) to *positive influence* (50), *not at all* (0) to *very much* (100), and *negative impact* (-50) to *not at all* (0) to *positive impact* (50). There were two open-ended questions for subjects: *Describe how having to memorize impacts you as a pianist* and *What do you do when you experience memory lapses during public performance?* Through these open-ended questions, subjects could offer opinions and perceptions of memorization and performance anxiety.

The Competitive State Anxiety Inventory-2 is a tool developed to evaluate people's feelings before a competition or performance. The inventory contains 27 questions scored on a four-point Likert scale ranging from *not at all* (1) to *very much so* (4). Created by Martens, Vealey, and Burton,[37] the CSAI-2 inventory produces three scores: cognitive state anxiety, related component-self-confidence, and somatic state anxiety as shown in Table 2.1. Theoretically, self-confidence is associated with the directional impact of cognitive anxiety and represents a meaningful component for controlling the debilitating consequence of performance anxiety. Each category (cognitive state anxiety, somatic anxiety, and related component-self-

[37] Rainer Martens, Robin S. Vealey, and Damon Burton, *Competitive Anxiety in Sport* (Illinois: Human Kinetics Books, 1990), 177.

confidence) scores ranges from 9 to 36, with low scores suggesting low anxiety and high scores suggesting high anxiety.[38]

Table 2.1: Competitive State Anxiety Inventory-2 Scoring[39]

Subscales		Scoring
_____	Cognitive State Anxiety	Sum of items: 1, 4, 7, 10, 13, 16, 19, 22, and 25
_____	Somatic State Anxiety	Sum of items: 2, 5, 8, 11, 14, 17, 20, 23, and 26
_____	Self-Confidence	Sum of items: 3, 6, 9, 12, 15, 18, 21, 24, and 27

2.3 Data Preparation and Analysis

All data were exported from Qualtrics and into the IBM SPSS Statistics for Mac, ver. 26 (IBM Corp., Armonk, NY, USA). In order to address research questions, ranges (minimum and maximum), means, and standard deviations were calculated for most parametric variables. These data were then used to examined specific associations with demographics, musical background, memorization awareness, performance anxiety, and memory lapses using Pearson's correlation coefficient. Qualitative data exported from IBM SPSS program, and the responses were categorized by repeated words/phrases.

Table 2.2: Recoded Age Variables

Variables	Total Sample	
	Frequency	Percent
18 thru 30 = 1	41	24.8
31 thru 36 = 2	43	26.1
37 thru 50 = 3	40	24.2
51 thru 84 = 4	39	23.6

[38] Martens, Vealey, and Burton, *Competitive Anxiety in Sport*, 176.

[39] Ibid., 176.

There is one continuous data in Table 2.2 was recoded into categorical data, these items kept the original data and re-categorized data. The recoded age variables (Q. 4) assumed are arranged by the following categories 1) 18 thru 30: academic year (n = 41, 24.8%), 2) 31 thru 36: graduate studies and early career (n = 43, 26.1%), 3) 37 thru 50: mature career (n = 40, 24.2%), 4) 51 thru 84: maestro (n = 39, 23.6%). Those four recoded different variables that spread a similar percentage of participants.

CHAPTER 3

RESULTS

3.1 Descriptive Profiles of Survey Respondents

After reviewing for incomplete surveys, the final database included responses from 162 subjects as shown in Table 3.1.

Table 3.1: Demographics

Variables		Total Sample	
		Frequency	Percent
Gender	Male	49	29.7
	Female	113	68.5
	Total	162	
Ethnicity	White	74	44.8
	Black or African American	1	0.6
	American Indian or Alaska Native	1	0.6
	Asian	80	48.5
	Native Hawaiian or Pacific Islander	0	0
	Other	8	4.8
Number of currently piano major students		66	40
Number of piano faculty in college/university		77	46.7
Highest degree received	Bachelor	25	15.2
	Master	45	27.3
	Doctorate	77	46.7
	Professional (Performance diploma or artistic certificate)	8	4.8
Age (*SD*)	Min. 18	Mean: 40.03 (± 14.66)	
	Max. 84		

The majority were female (n = 113, 68.5%), with ages between 18 and 84. The average age of 40.04 (*SD* ± 14.66). Seventy-four reported being White (44.8%) and eighty being Asian (48.5%). The status of subjects was mostly piano professors (n = 77, 46.7%) and current piano major students (n = 66, 40%). Subjects reported having a doctorate (n = 77, 46.7%), and/or a graduate/professional degree (n = 130, 78.8%).

Table 3.2 shows musical background data. Subjects' average years of playing the piano were 32 years (*SD* ± 15.50) while most respondents over 30 years old held a Master's degree. Average practice hours were thirteen hours per week with a range between 0 and 35 hours. The average number of public performances per year was 11.17 (*SD* ± 14.21) and ranged from – to 75 times per year.

Table 3.2: Musical Background

Variables	Mean (SD)	Range
Avg. Years of playing piano	32.68 (± 15.50)	0-72
Avg. Practice hours per week	13.54 (± 7.77)	0-35
Avg. Teaching hours per week	10.45 (± 8.37)	0-35
Number of public performances per year	11.17 (± 14.21)	0-75

3.2 Music Memorization Awareness

As shown in Table 3. 3, subjects reported a fairly strong memorizing ability (M = 73.19, *SD* ± 23.99). They also reported spending time memorizing away from the piano. The mean score for frequency of memory lapses was 38 on a 100-point VAS scale ranging from never to always. The overall mean score for impact of memory on performance was positive suggesting that the ability to play from memory does positively impact quality. However, 30.9% percentage of subjects reported a negative impact of memory performance quality.

Table 3.3: Music Memorization Awareness

Variables	Mean (SD)	Range
Your memorizing ability	73.19 (± 23.99)	5-100
Time spend memorizing away from piano	46.18 (± 27.68)	0-100
Frequency of memory lapses	38.12 (± 29.45)	0-100
Impact of memory on performance quality	15.38 (± 30.07)	-50(Negative) -50(Positive)

3.3 The Familiarity of Memory Strategies

Table 3.4 shows the mean of familiarity with the six memory strategies. Respondents reported elevated familiarity for motor memory (*M* = 84.87, *SD* ± 22.67), auditory memory (*M* = 83.52, *SD* ± 22.53), structural memory (*M* = 83.36, *SD* ± 20.98), and visual memory (*M* = 82.79, *SD* ± 22.58). In contrast, the level of familiarity was lower for emotional memory (*M* = 65.83 *SD* ± 32.63) and linguistic memory (*M* = 56.10, *SD* ± 33.85).

Table 3.4: The Familiarity with Memory Strategies

Variables	Mean (SD)	Range
Motor memory	84.87 (± 22.67)	0-100
Visual memory	82.79 (± 22.58)	0-100
Auditory memory	83.52 (± 22.53)	0-100
Linguistic memory	56.10 (± 33.85)	0-100
Emotional memory	65.83 (± 32.63)	0-100
Structural memory	83.36 (± 20.98)	16-100

3.4 The Frequency of Using Memory Strategies

Table 3.5 shows the average of respondents' frequency of using memory strategies.

Table 3.5: The Frequency of Using Memory Strategies

Variables	Mean (SD)	Range
Motor memory	79.88 (± 25.22)	0-100
Visual memory	72.18 (± 26.76)	0-100
Auditory memory	81.38 (± 20.66)	0-100
Linguistic memory	47.53 (± 34.39)	0-100
Emotional memory	61.19 (± 31.60)	0-100
Structural memory	80.45 (± 23.06)	0-100

Similar to responses for familiarity, subjects reported high use levels for motor memory (*M* = 79.88, *SD* ± 25.22), auditory memory (*M* = 81.38, *SD* ± 20.66), structural memory (*M* = 80.45, *SD* ± 23.06), and visual memory (*M* = 72.18, *SD* ± 26.76). Again, subjects reported less use of emotional memory (*M* = 65.83 *SD* ± 32.63) and linguistic memory (*M* = 56.10, *SD* ± 33.85).

3.5 Performance Anxiety Awareness

Table 3. 6 shows that nearly all subjects (94%) reported experiencing performance anxiety when performing. As shown in Table 3.7, subjects also reported that this occurred fairly frequently and, on average, has a negative impact on performance. However, 34.3% percent of subjects did report that performance anxiety has a positive impact on performance. The mean influence of performance anxiety on the ability to perform by memory was 55.25 on a scale from 0 (not at all) to 100 (very much).

Table 3.6: Performance Anxiety

Experiences of Performance Anxiety	Frequency	Valid Percent
Yes	137	93.8%
No	9	6.2%

Table 3.7: Experience with Performance Anxiety

Variables	Mean (SD)	Range
Frequency of Performance Anxiety	62.28 (± 33.28)	2-100
Impact of Performance Anxiety on Performance Quality	-5.69 (± 27.26)	-50(Negative) – 50(Positive)
Influence of Performance Anxiety on Memory	55.25 (± 34.24)	0-100

3.6 The Scoring of Competitive State Anxiety Inventory-2

Table 3.8: The Results of CSAI-2 Scoring

Variable	Mean (SD)	Range
Cognitive Anxiety	22.40(± 6.92)	9-36
Somatic Anxiety	20.38 (± 6.41)	9-36
Self-Confidence	20.41 (± 5.91)	10-36

Results from the CSAI-2 are shown in Table 3.8. The mean score for cognitive anxiety

(22.4) was slightly higher than the mean score for somatic anxiety (20.38). The mean score of self-confidence was 20.41.

3.7 Relationship between Memorizing Questions, and Musical Background, and Memory Strategies Variables

As shown in Table 3.9, age was significantly ($p<.00$) associated with frequency of memory lapses suggesting that younger pianists experience memory lapses more frequently than older pianists. However, age was not significantly associated with memorizing ability or impact of memory on performance quality. Similarly, the number of years playing the piano was significantly associated with frequency of memory lapses. Memorizing ability was significantly associated with the number of teaching hours per week but not with the number of performances per year. The scatterplots in Figures 3.1-3 show the strength and direction of these significant relationships.

Table 3.9: Pearson's Correlation Coefficients between Memorizing Questions and Musical Background Variables

		Memorizing Ability	Frequency of Memory Lapses	Impact of Memory on Performance Quality
Age	Pearson Correlation	.074	-.255**	.064
	Sig. (2-tailed)	.350	.002	.437
Years of Playing	Pearson Correlation	.101	-.274**	.078
	Sig. (2-tailed)	.200	.001	.345
Practice Hours per Week	Pearson Correlation	-.007	-.079	.019
	Sig. (2-tailed)	.927	.339	.818
Teaching Hours per Week	Pearson Correlation	.163	.031	.031
	Sig. (2-tailed)	.039*	.704	.704
Performances per Year	Pearson Correlation	-.040	-.078	-.078
	Sig. (2-tailed)	.611	.346	.346

** Correlation is significant at the 0.01 level. * Correlation is significant at the 0.05 level.

Figure 3.1: Relationship between Memorizing Ability and Teaching Hours per Week

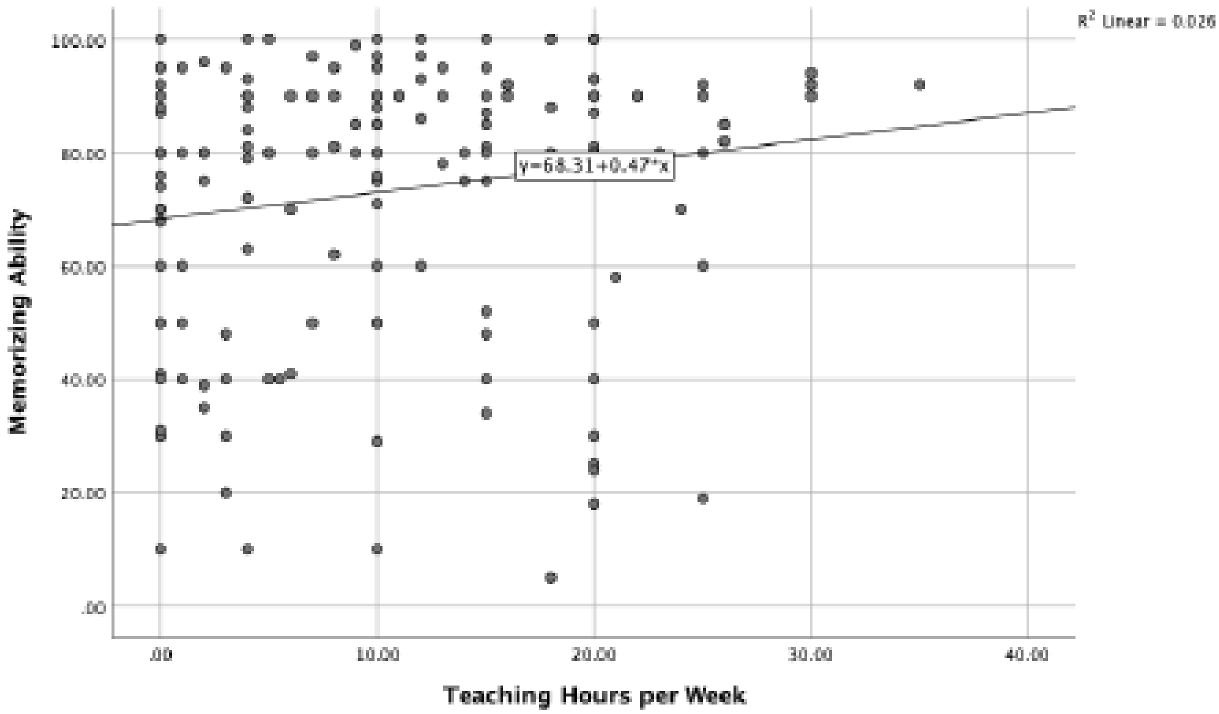


Figure 3.2: Relationship between Frequency of Memory Lapses and Age

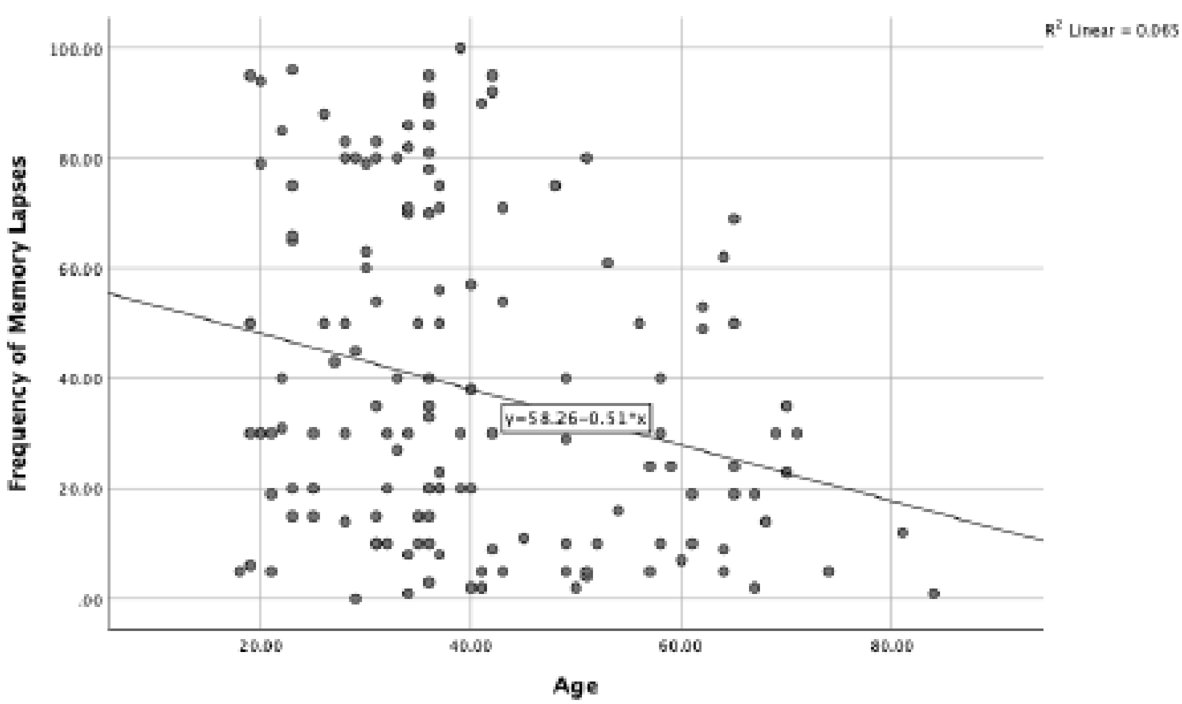


Figure 3.3: Relationship between Frequency of Memory Lapses and Years of Playing Piano

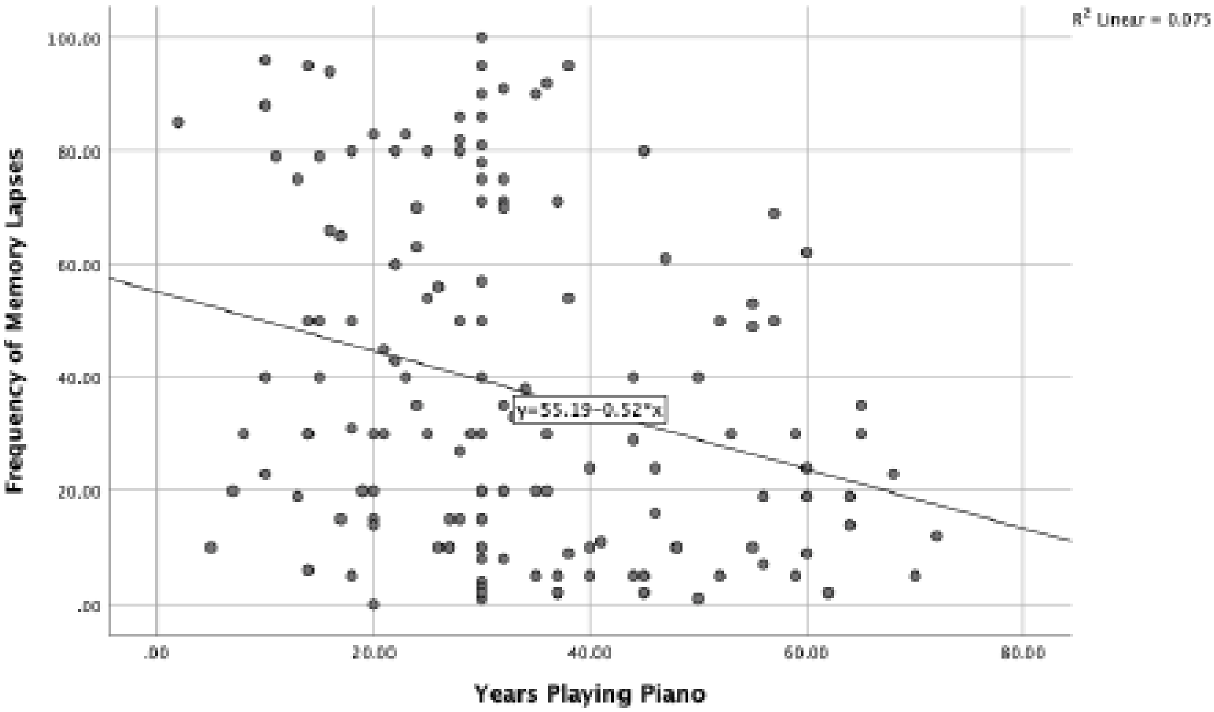


Table 3.10 shows a Pearson's correlation between the memorizing questions and the familiarity of the six memory strategies. The six memory strategy variables were correlated significantly with one or more categories of memorizing ability, frequency of memory lapses, and impact of memory on performance quality. The memorizing ability and the frequency of memory lapses significantly correlated with the familiarity of motor memory, auditory memory, and structural memory. The memorizing ability and the impact of memory on performance quality significantly correlated with the familiarity of visual memory. Also, familiarity of emotional memory with memorizing ability was found to be significant. Figures 3.4-9 includes the scatterplots to show the direction of a significant relationship between the variables. Figures 3.7-9 indicate the negative relationships, which mean that less familiarity of memory strategies has a high level of frequency of memory lapses.

Table 3.10: Pearson's Correlation Coefficients between Memorizing Questions and Familiarity with Memory Strategies

		Memorizing Ability	Frequency of Memory Lapses	Impact of Memory on Performance Quality
Familiar with Motor Memory	Pearson Correlation	.376**	-.162*	.144
	Sig. (2-tailed)	.000	.050	.083
Familiar with Visual Memory	Pearson Correlation	.322**	-.081	.191*
	Sig. (2-tailed)	.000	.331	.021
Familiar with Auditory Memory	Pearson Correlation	.325**	-.287**	.112
	Sig. (2-tailed)	.000	.000	.175
Familiar with Linguistic Memory	Pearson Correlation	.151	.004	-.039
	Sig. (2-tailed)	.081	.965	.665
Familiar with Emotional Memory	Pearson Correlation	.201*	-.014	-.018
	Sig. (2-tailed)	.017	.878	.836
Familiar with Structural Memory	Pearson Correlation	.336**	-.221**	.145
	Sig. (2-tailed)	.000	.007	.082

Figure 3.4: Relationship between Memorizing Ability and Familiar with Motor Memory

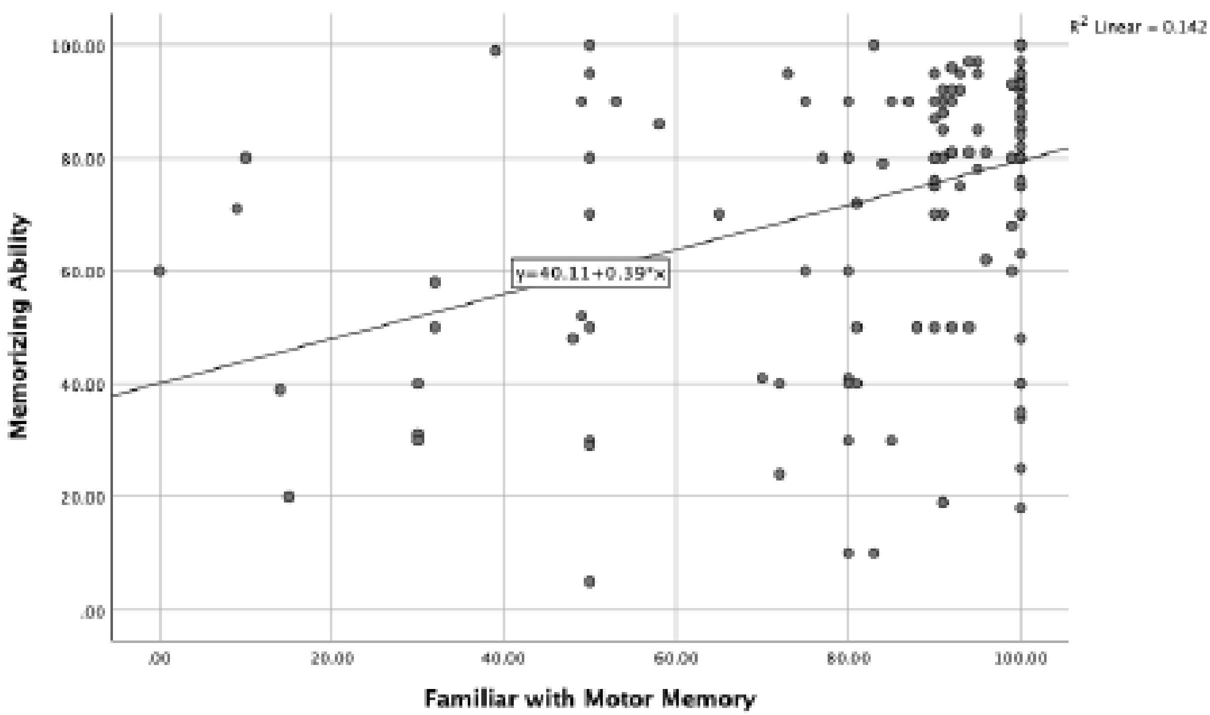


Figure 3.5: Relationship between Memorizing Ability and Familiar with Visual Memory

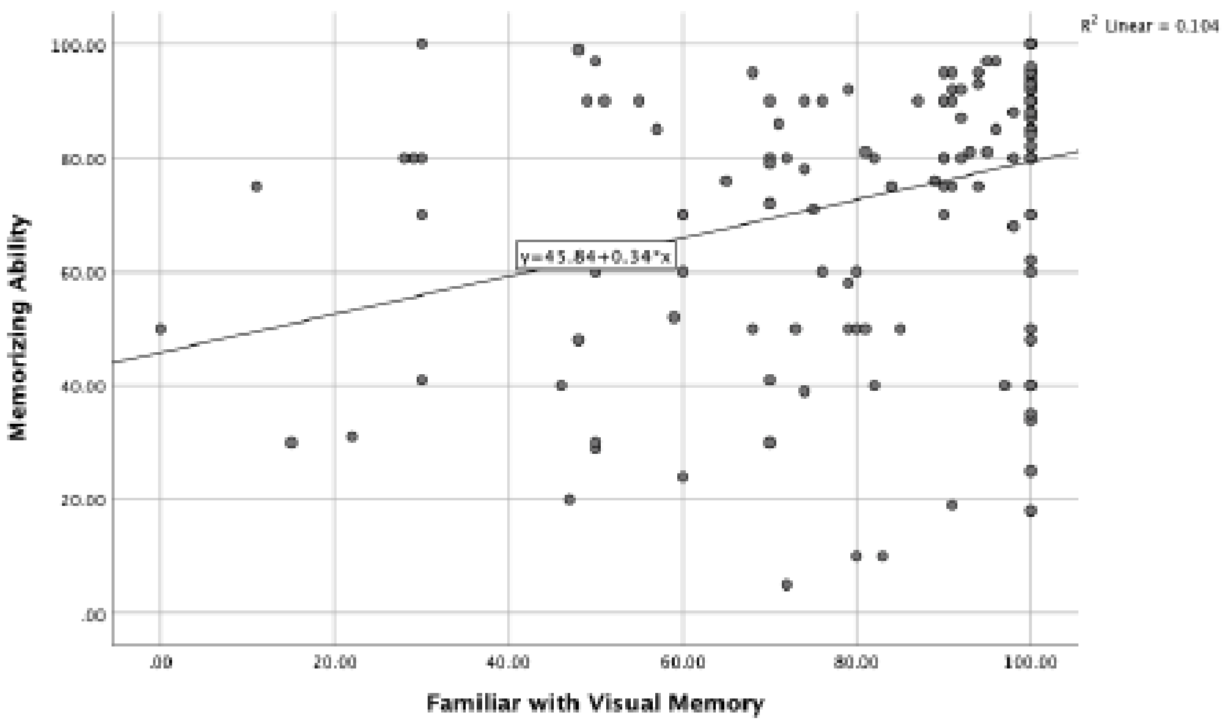


Figure 3.6: Relationship between Memorizing Ability and Familiar with Auditory Memory

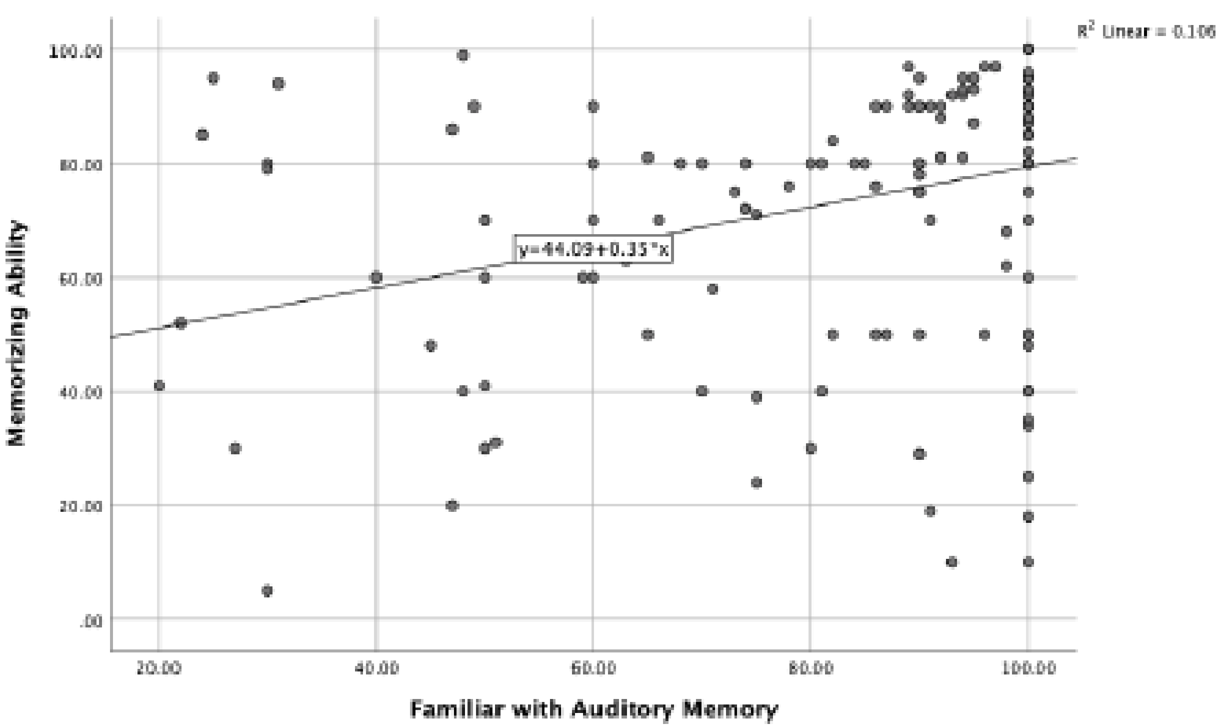


Figure 3.7: Relationship between Frequency of Memory Lapses and Familiar with Motor Memory

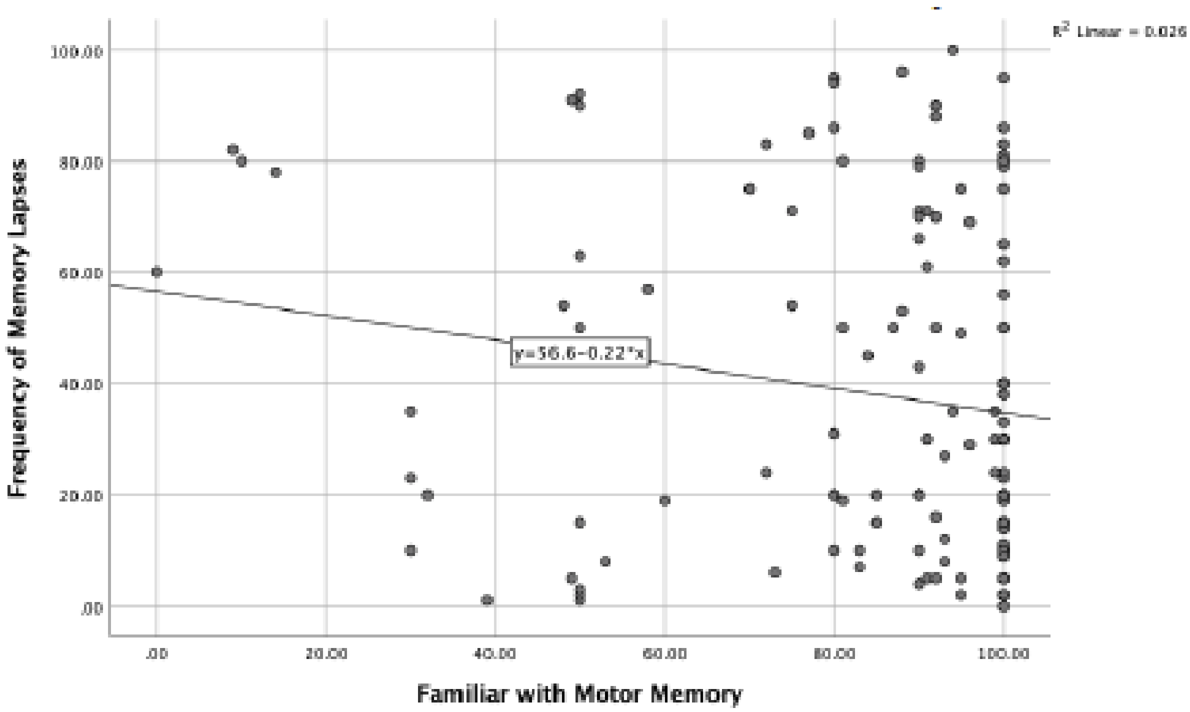


Figure 3.8: Relationship between Frequency of Memory Lapses and Familiar with Auditory Memory

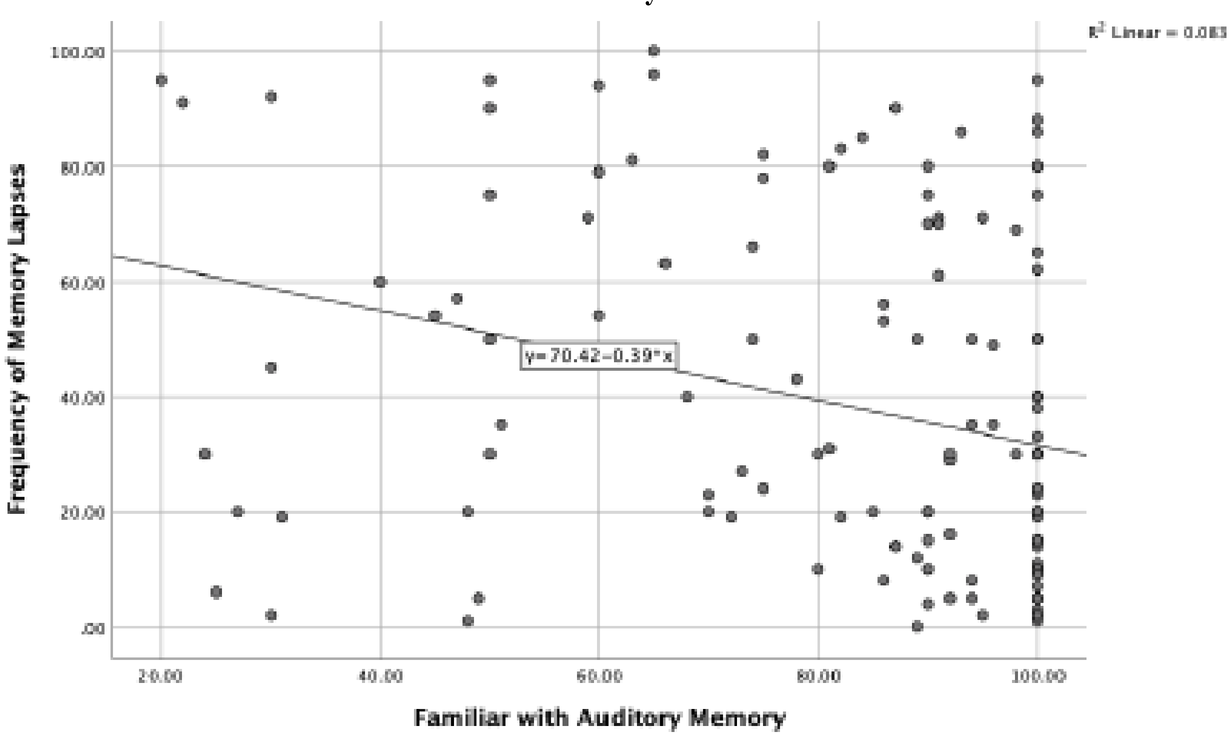


Figure 3.9: Relationship between Frequency of Memory Lapses and Familiar with Structural Memory

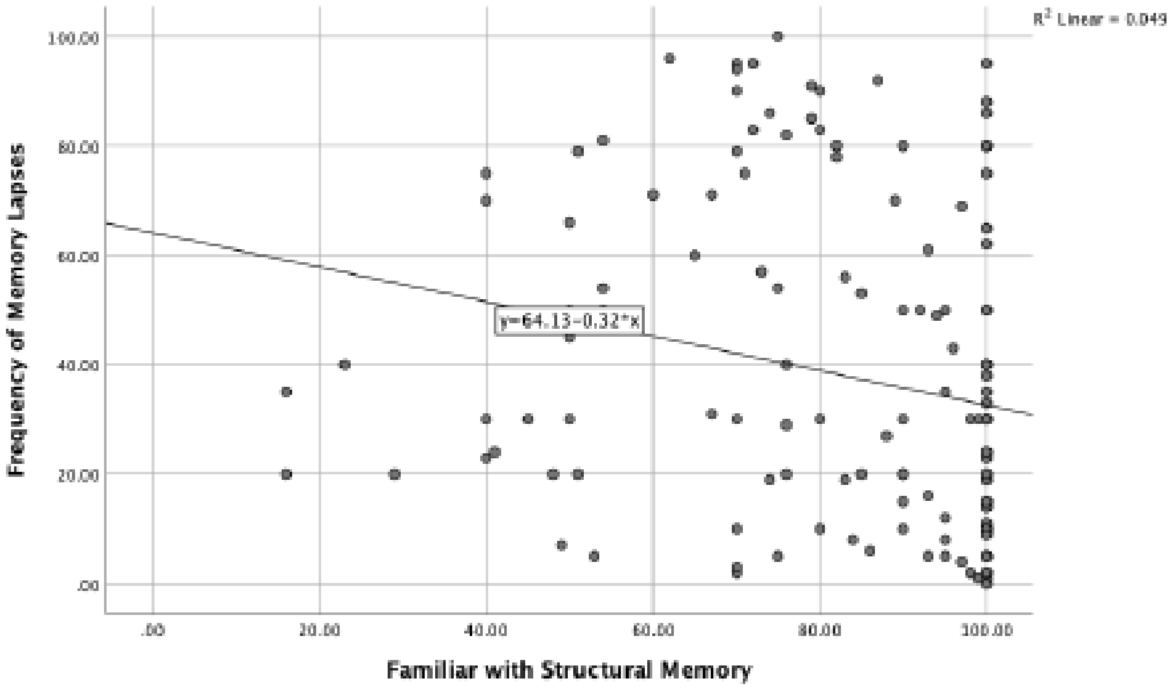


Table 3.11 shows a Pearson's correlation between the memorizing questions and the frequency of using memory strategies. Frequency of using auditory memory and structural memory significantly correlated with all three memorizing questions. Besides, the frequency of using motor memory, visual memory, and emotional memory significantly correlated with memorizing ability. The scatterplots in Figures 3.10-14 show the strength and direction of these significant relationships.

Table 3.11: Pearson's Correlation Coefficients between Memorizing Questions and Frequency of Using Memory Strategies

		Memorizing Ability	Frequency of Memory Lapses	Impact of Memory on Performance Quality
Frequency of Using Motor Memory	Pearson Correlation	.222**	.032	.111
	Sig. (2-tailed)	.006	.704	.184
Frequency of Using Visual Memory	Pearson Correlation	.267**	.094	.172*
	Sig. (2-tailed)	.001	.264	.040

(table continues)

		Memorizing Ability	Frequency of Memory Lapses	Impact of Memory on Performance Quality
Frequency of Using Auditory Memory	Pearson Correlation	.337**	-.230**	.237**
	Sig. (2-tailed)	.000	.005	.004
Frequency of Using Linguistic Memory	Pearson Correlation	.125	-.106	.041
	Sig. (2-tailed)	.183	.272	.673
Frequency of Using Emotional Memory	Pearson Correlation	.182*	-.078	.085
	Sig. (2-tailed)	.037	.397	.354
Frequency of Using Structural Memory	Pearson Correlation	.317**	-.201*	.209*
	Sig. (2-tailed)	.000	.016	.012

** Correlation is significant at the 0.01 level. * Correlation is significant at the 0.05 level.

Figure 3.10: Relationship between Memorizing Ability and Frequency of Using Auditory Memory

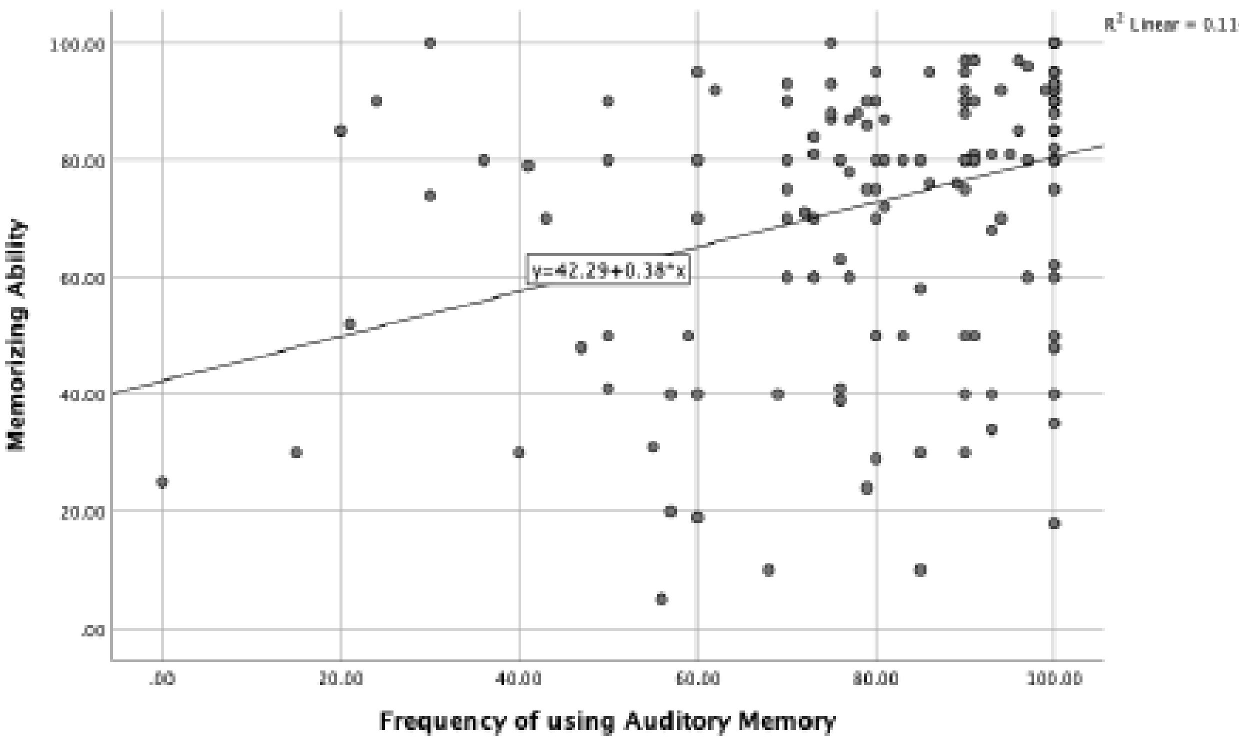


Figure 3.11: Relationship between Memorizing Ability and Frequency of Using Structural Memory

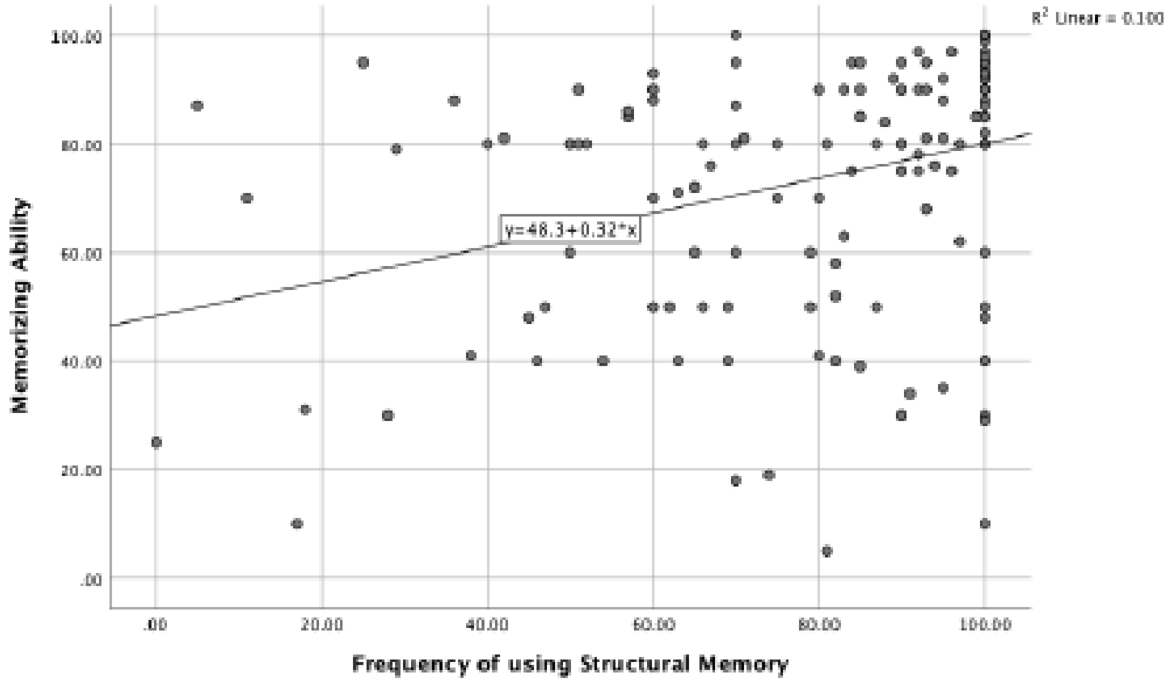


Figure 3.12: Relationship between Frequency of Memory Lapses and Frequency of Using Auditory Memory

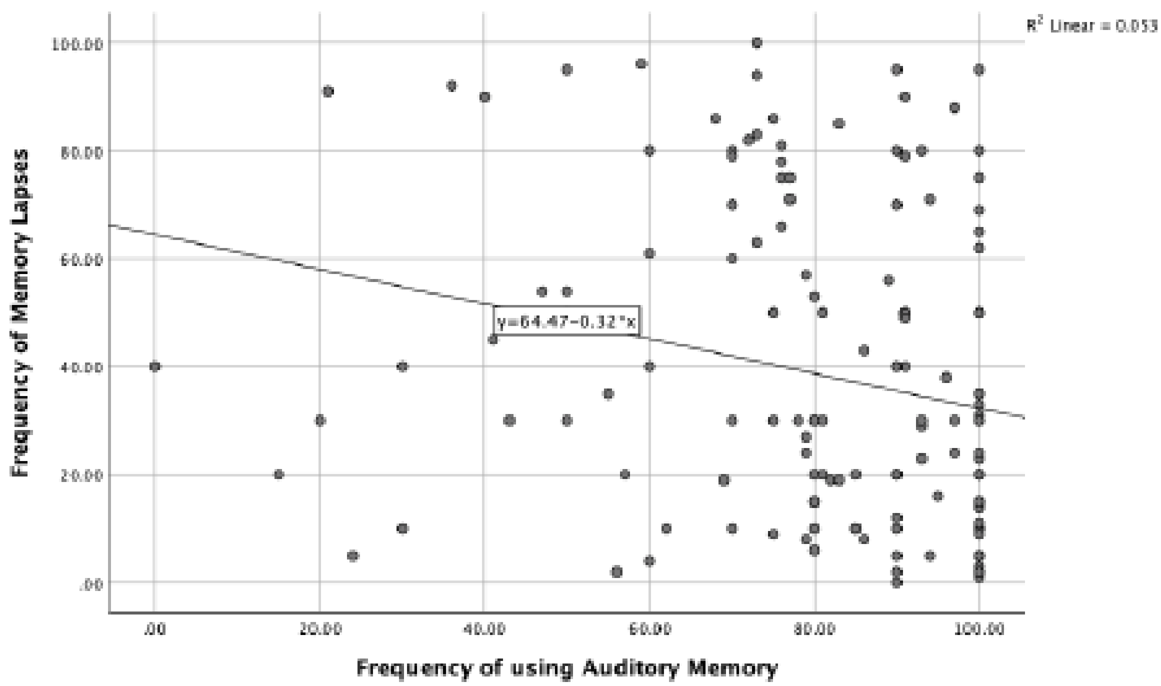


Figure 3.13: Relationship between Frequency of Memory Lapses and Frequency of Using Structural Memory

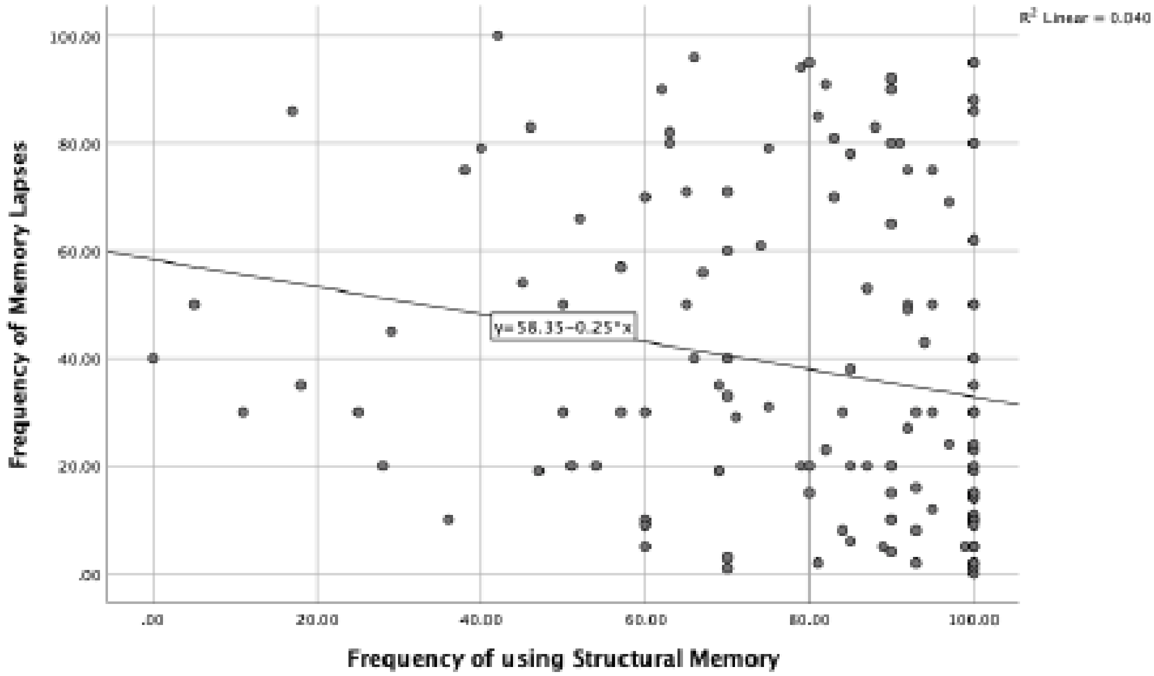
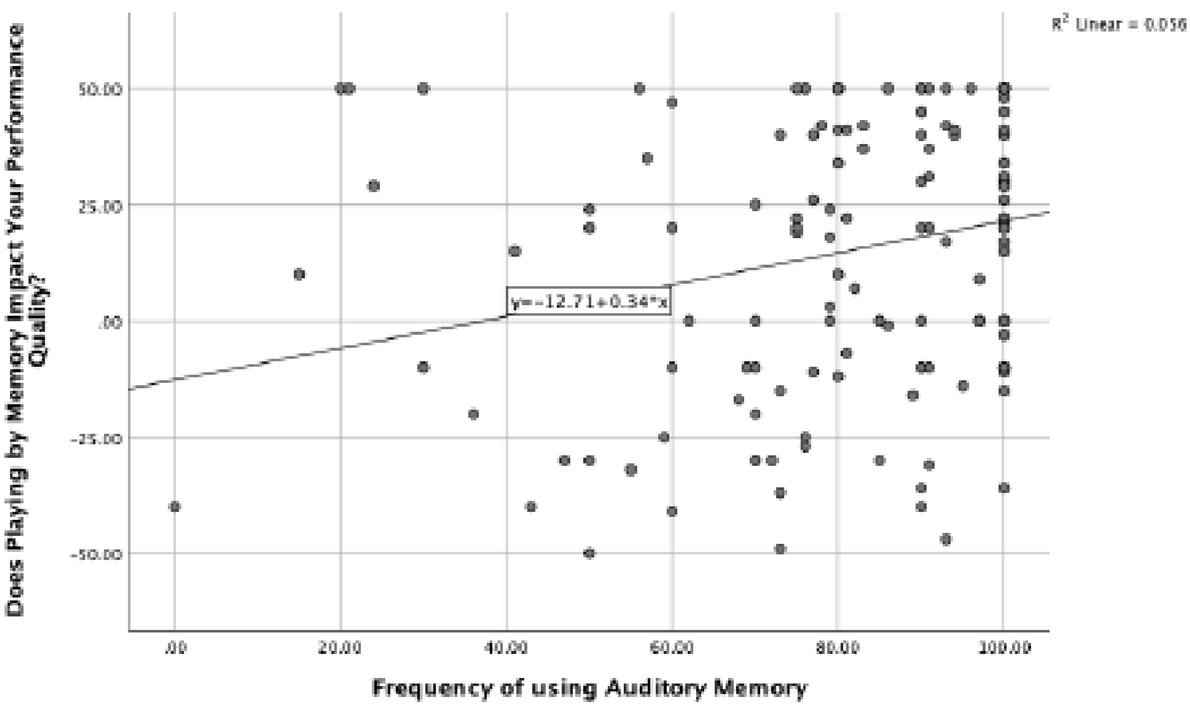


Figure 3.14: Relationship between Impact of Memory on Performance Quality and Frequency of Using Auditory Memory



3.8 Relationship between Performance Anxiety Questions, and Musical Background, Memory Lapses, and Memory Strategies Variables

Table 3.12 shows a significant relationship between the three performance anxiety questions and musical background variables. Age, years of playing piano, practice hours per week, and performances per year highly correlated with the frequency of performance anxiety; a high number of musical background variables indicated less frequency of performance anxiety.

In addition, years of playing piano, teaching hours per week, and performances per year significantly correlated with the impact of performance anxiety on performance quality. Also, the influence of performance anxiety on performance by memory is highly correlated with teaching hours per week. Figures 3.15-18 indicate the scatterplots to show the direction of a noticeable significant relationship between performance anxiety questions and the musical background variables.

Table 3.12: Pearson's Correlation Coefficients between Performance Anxiety Questions and Musical Background Variables

		Frequency of PA	Impact of PA on Performance Quality	Influence of PA on Performance by Memory
Age	Pearson Correlation	-.231**	.132	-.103
	Sig. (2-tailed)	.006	.117	.226
Years of Playing	Pearson Correlation	-.268**	.182*	-.119
	Sig. (2-tailed)	.001	.029	.160
Practice Hours per Week	Pearson Correlation	-.177*	-.059	-.087
	Sig. (2-tailed)	.034	.485	.309
Teaching Hours per Week	Pearson Correlation	-.110	.217**	-.238**
	Sig. (2-tailed)	.191	.009	.005
Performances per Year	Pearson Correlation	-.247**	.276**	-.124
	Sig. (2-tailed)	.003	.001	.145

** Correlation is significant at the 0.01 level. * Correlation is significant at the 0.05 level.

Figure 3.15: Relationship between Frequency of Performance Anxiety and Age

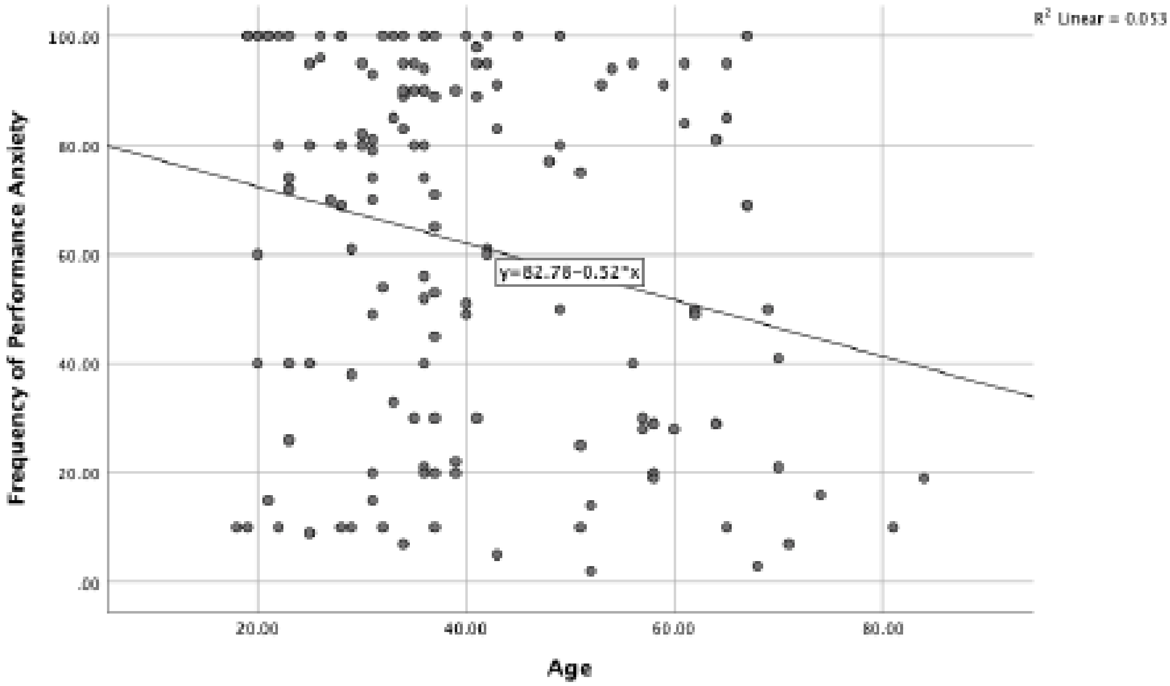


Figure 3.16: Relationship between Frequency of Performance Anxiety and Years of Playing Piano

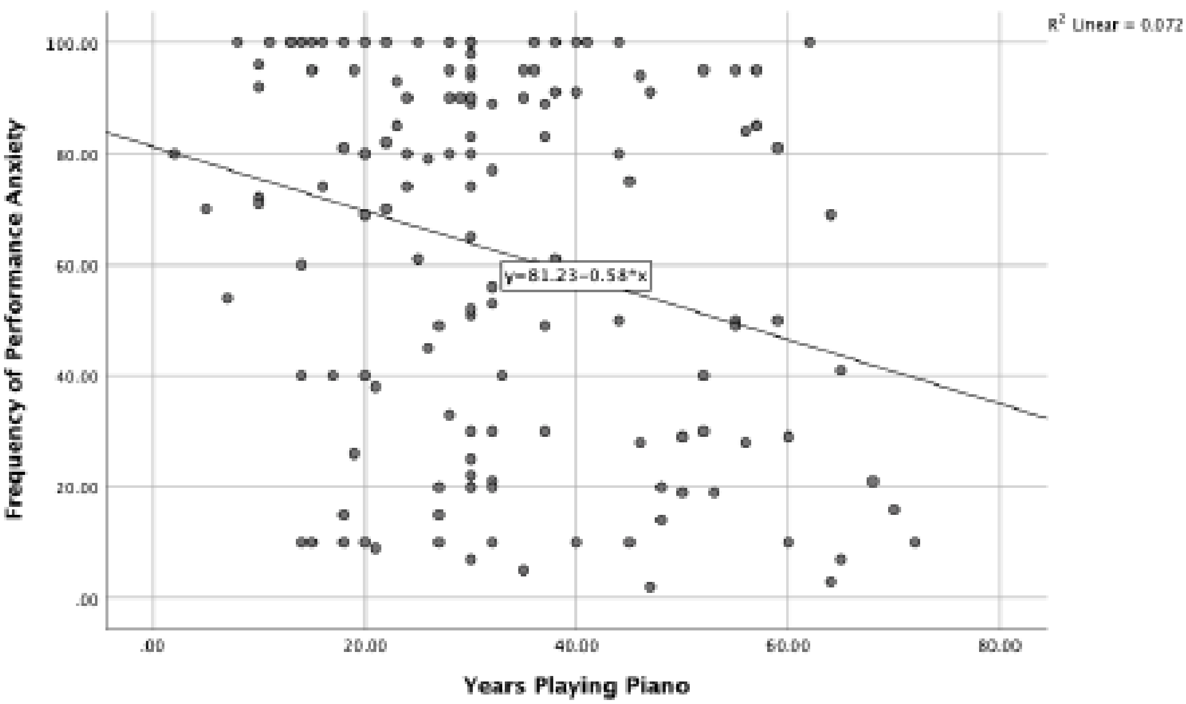


Figure 3.17: Relationship between Frequency of Performance Anxiety and Performances per Year

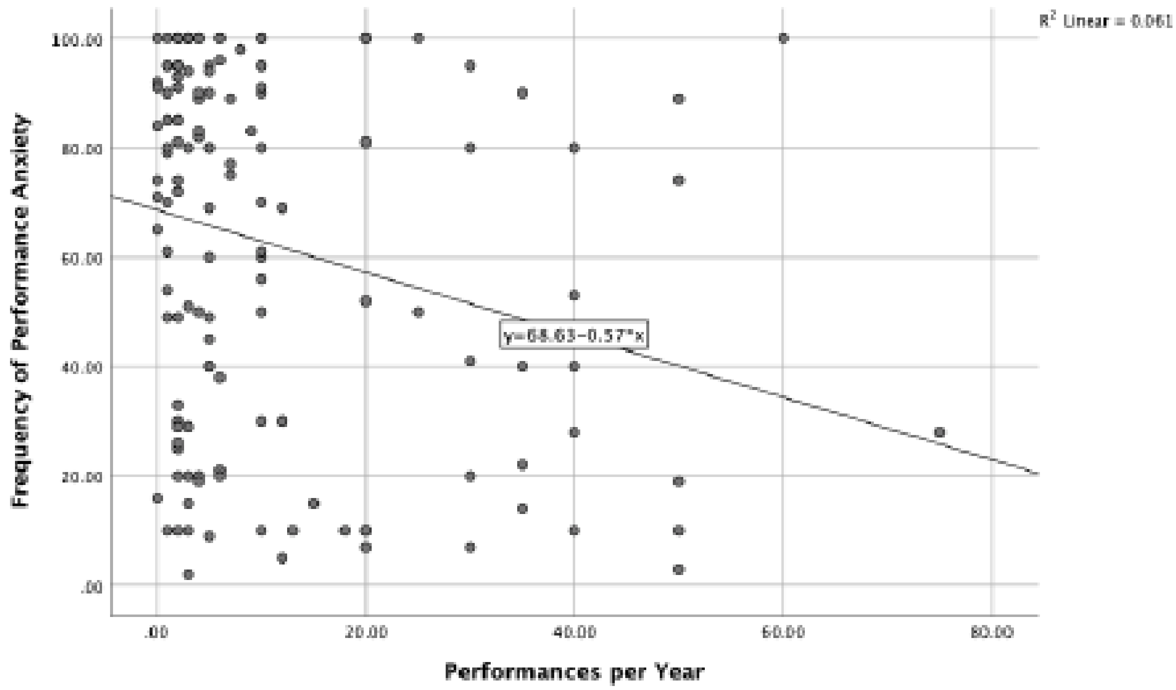


Figure 3.18: Relationship between Impact of Performance Anxiety on Performance Quality and Performances per Year

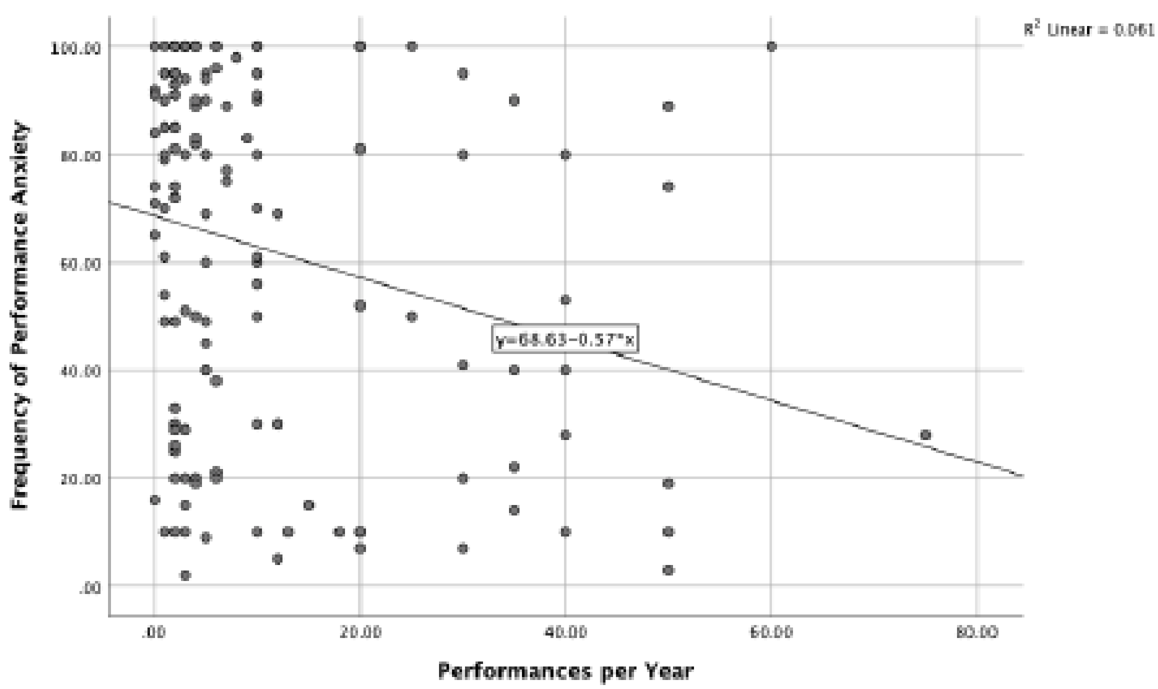


Table 3.13 shows a significant relationship between performance anxiety questions and memory lapse variables, that all performance anxiety variables were significantly correlated with all memory lapse variables except between memorizing ability and impact of performance anxiety on performance quality. Figures 3.19-22 indicate the scatterplots to show the direction of a significant relationship between performance anxiety questions and the memory lapses variables.

Table 3.13: Pearson's Correlation Coefficients between Performance Anxiety Questions and Memory Lapse Variables

		Frequency of PA	Impact of PA on Performance Quality	Influence of PA on Performance by Memory
Memorizing Ability	Pearson Correlation	-.220**	.139	-.528**
	Sig. (2-tailed)	.008	.097	.000
Frequency of Memory Lapses	Pearson Correlation	.367**	-.240**	.623**
	Sig. (2-tailed)	.000	.004	.000
Impact of Memory on Performance Quality	Pearson Correlation	-.174*	.369**	-.264**
	Sig. (2-tailed)	.040	.000	.002

** Correlation is significant at the 0.01 level. * Correlation is significant at the 0.05 level.

Figure 3.19: Relationship between Frequency of Performance Anxiety and Frequency of Memory Lapses

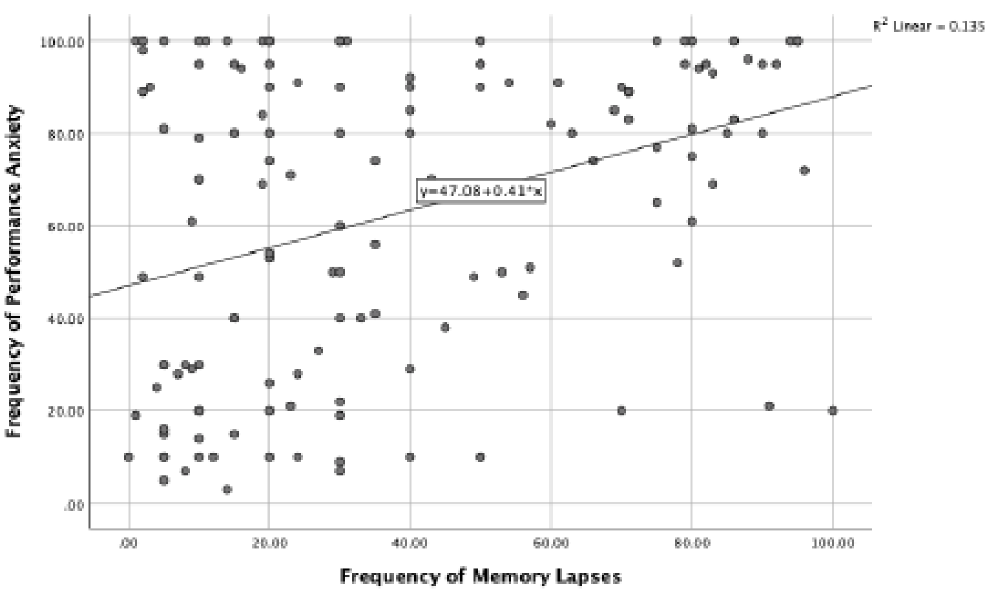


Figure 3.20: Relationship between Impact of Performance Anxiety on Performance Quality and Impact of Memory on Performance Quality

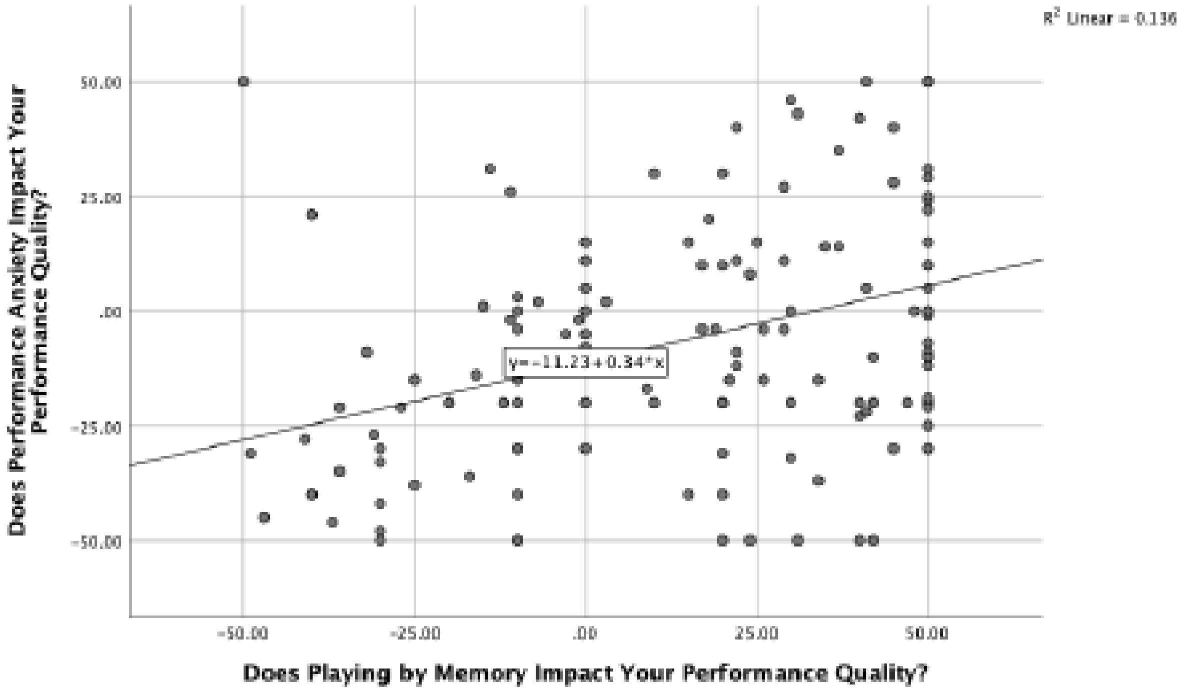


Figure 3.21: Relationship between Influence of Performance Anxiety on Performance by Memory and Memorizing Ability

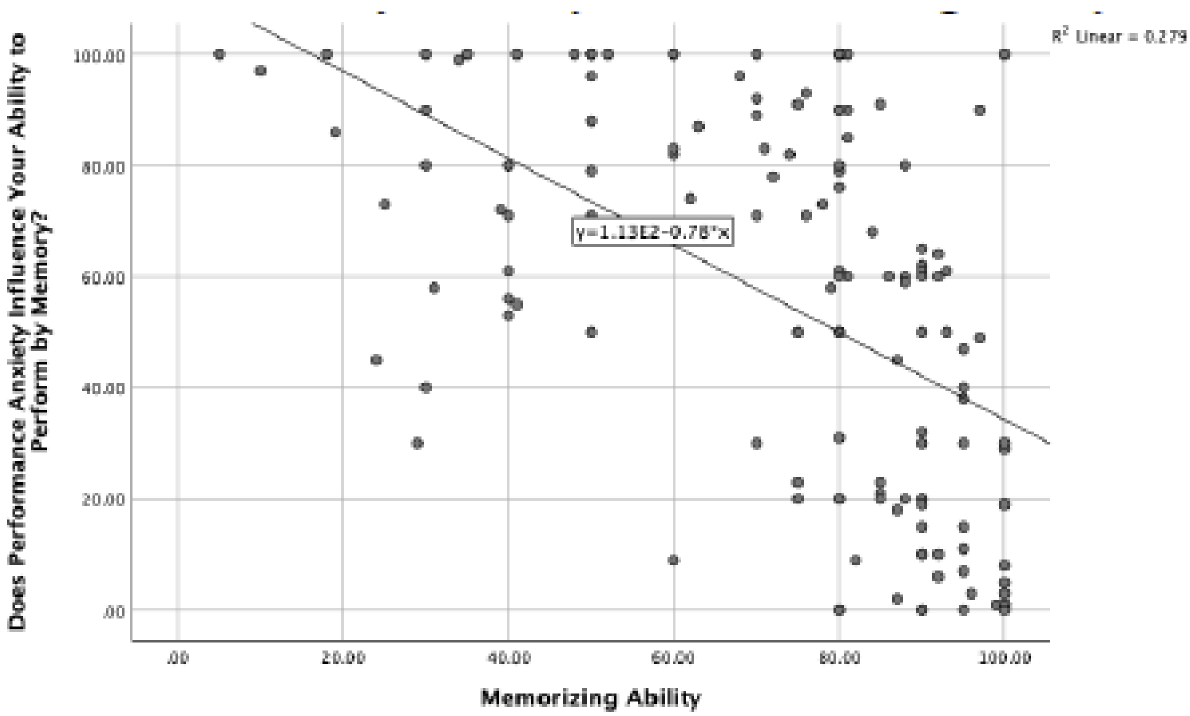


Figure 3.22: Relationship between Influence of Performance Anxiety on Performance by Memory and Frequency of Memory Lapses

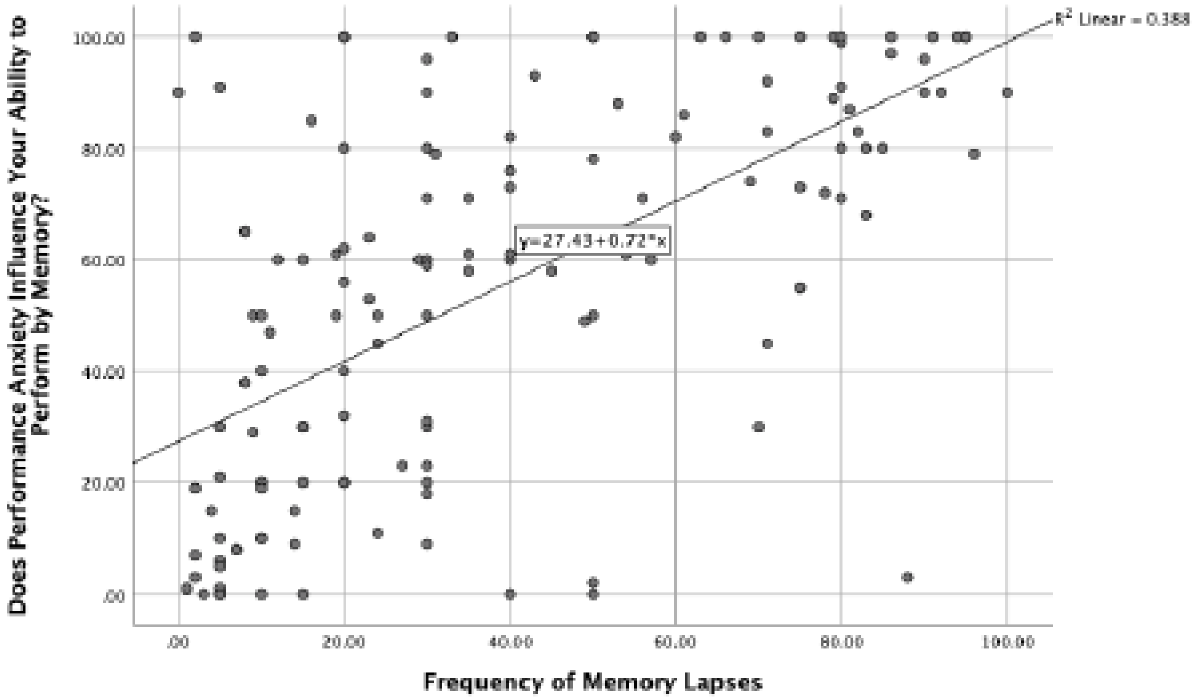


Table 3.14 shows a significant relationship between performance anxiety questions and familiarity of memory strategies. Neither the frequency of performance anxiety and impact of performance anxiety on performance with all of the memory strategies was significantly correlated. The influence of performance anxiety on performance by memory was significantly correlated with the familiarity of motor memory, visual memory, auditory memory, and structural memory.

Table 3.14: Pearson's Correlation Coefficients between Performance Anxiety Questions and Familiarity of Memory Strategies Variables

		Frequency of PA	Impact of PA on Performance Quality	Influence of PA on Performance by Memory
Familiar with Motor Memory	Pearson Correlation	-.123	-.050	-.189*
	Sig. (2-tailed)	.148	.562	.027
Familiar with Visual Memory	Pearson Correlation	-.146	.100	-.223**
	Sig. (2-tailed)	.085	.239	.009

(table continues)

		Frequency of PA	Impact of PA on Performance Quality	Influence of PA on Performance by Memory
Familiar with Auditory Memory	Pearson Correlation	-.121	.037	-.340**
	Sig. (2-tailed)	.155	.664	.000
Familiar with Linguistic Memory	Pearson Correlation	-.060	.123	-.146
	Sig. (2-tailed)	.519	.179	.115
Familiar with Emotional Memory	Pearson Correlation	-.057	.120	-.074
	Sig. (2-tailed)	.530	.184	.414
Familiar with Structural Memory	Pearson Correlation	-.125	.084	-.236**
	Sig. (2-tailed)	.143	.324	.005

** Correlation is significant at the 0.01 level. * Correlation is significant at the 0.05 level.

Table 3.15 shows a relationship between performance anxiety questions and the frequency of using memory strategies. There were two significant correlations – the influence of performance anxiety on performance by memory, and frequency using auditory memory and structural memory. In addition, frequency using of emotional memory positively correlated with the impact of performance anxiety on performance quality.

Table 3.15: Pearson's Correlation Coefficients between Performance Anxiety Questions and Frequency of Using Memory Strategies Variables

		Frequency of PA	Impact of PA on Performance Quality	Influence of PA on Performance by Memory
Frequency of Using Motor Memory	Pearson Correlation	.077	-.103	.008
	Sig. (2-tailed)	.370	.230	.930
Frequency of Using Visual Memory	Pearson Correlation	.111	.055	-.020
	Sig. (2-tailed)	.198	.523	.816
Frequency of Using Auditory Memory	Pearson Correlation	-.038	-.009	-.252**
	Sig. (2-tailed)	.654	.920	.003
Frequency of Using Linguistic Memory	Pearson Correlation	-.052	.306**	-.177
	Sig. (2-tailed)	.606	.002	.075

(table continues)

		Frequency of PA	Impact of PA on Performance Quality	Influence of PA on Performance by Memory
Frequency of Using Emotional Memory	Pearson Correlation	-.041	.132	-.060
	Sig. (2-tailed)	.667	.160	.525
Frequency of Using Structural Memory	Pearson Correlation	-.103	.138	-.176*
	Sig. (2-tailed)	.235	.109	.043

** Correlation is significant at the 0.01 level. * Correlation is significant at the 0.05 level.

3.9 Relationship between Competitive State Anxiety Inventory-2, and Musical Background, Memory Lapses, Memory Strategies, and Performance Anxiety Variables

The survey participants' responses to Competitive State Anxiety Inventory-2 scored into three components: Cognitive Anxiety, Somatic Anxiety, and Self-Confidence. Those three new variables were created in the SPSS and calculated between musical background, memory lapses, memory strategies, and performance anxiety questions.

Table 3.16 shows a Pearson's correlation between the Competitive State Anxiety Inventory-2 and musical background variables. Years of playing piano significantly correlated with all CSAI-2 variables, cognitive anxiety, somatic anxiety, and self-confidence. In addition, all musical background variables were positively correlated with self-confidence indicating that self-confidence is associated with higher levels of training, engagement, and performance. Also, age, years of playing piano, and performances per year highly correlated with somatic anxiety. The scatterplots in Figures 3.23-27 show the strength and direction of these significant relationships.

Table 3.16: Pearson's Correlation Coefficients between CSAI-2 and Musical Background

		Cognitive Anxiety	Somatic Anxiety	Self-Confidence
Age	Pearson Correlation	-.163	-.324**	.211*
	Sig. (2-tailed)	.052	.000	.012

(table continues)

		Cognitive Anxiety	Somatic Anxiety	Self-Confidence
Years of Playing	Pearson Correlation	-.179*	-.353**	.237**
	Sig. (2-tailed)	.032	.000	.004
Practice Hours per Week	Pearson Correlation	-.059	-.071	.179*
	Sig. (2-tailed)	.483	.402	.033
Teaching Hours per Week	Pearson Correlation	-.139	-.149	.167*
	Sig. (2-tailed)	.097	.078	.047
Performances per Year	Pearson Correlation	-.142	-.265**	.247**
	Sig. (2-tailed)	.089	.001	.003

** Correlation is significant at the 0.01 level. * Correlation is significant at the 0.05 level.

Figure 3.23: Relationship between Somatic Anxiety and Age

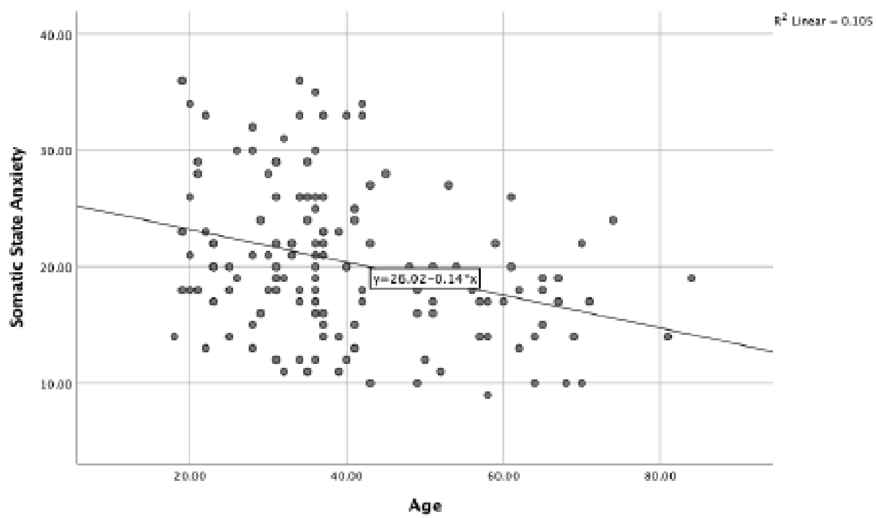


Figure 3.24: Relationship between Somatic Anxiety and Years of Playing Piano

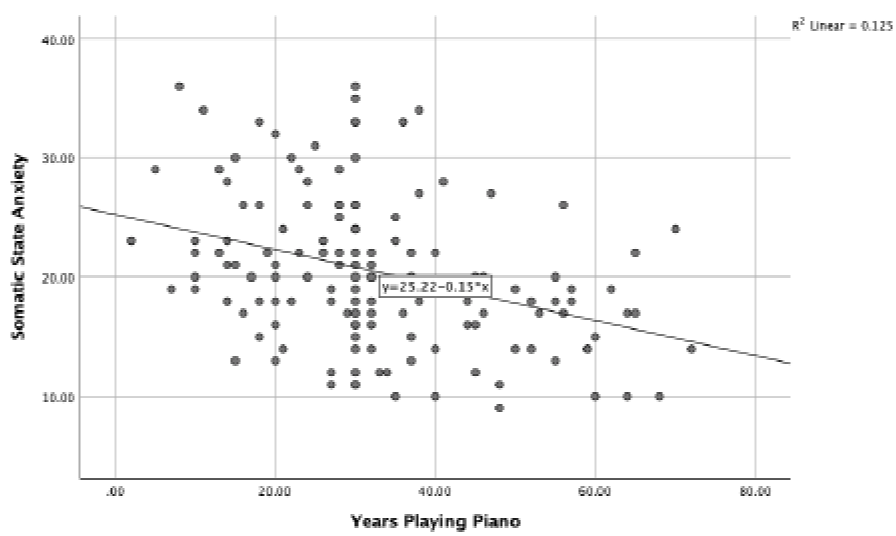


Figure 3.25: Relationship between Somatic Anxiety and Performances per Year

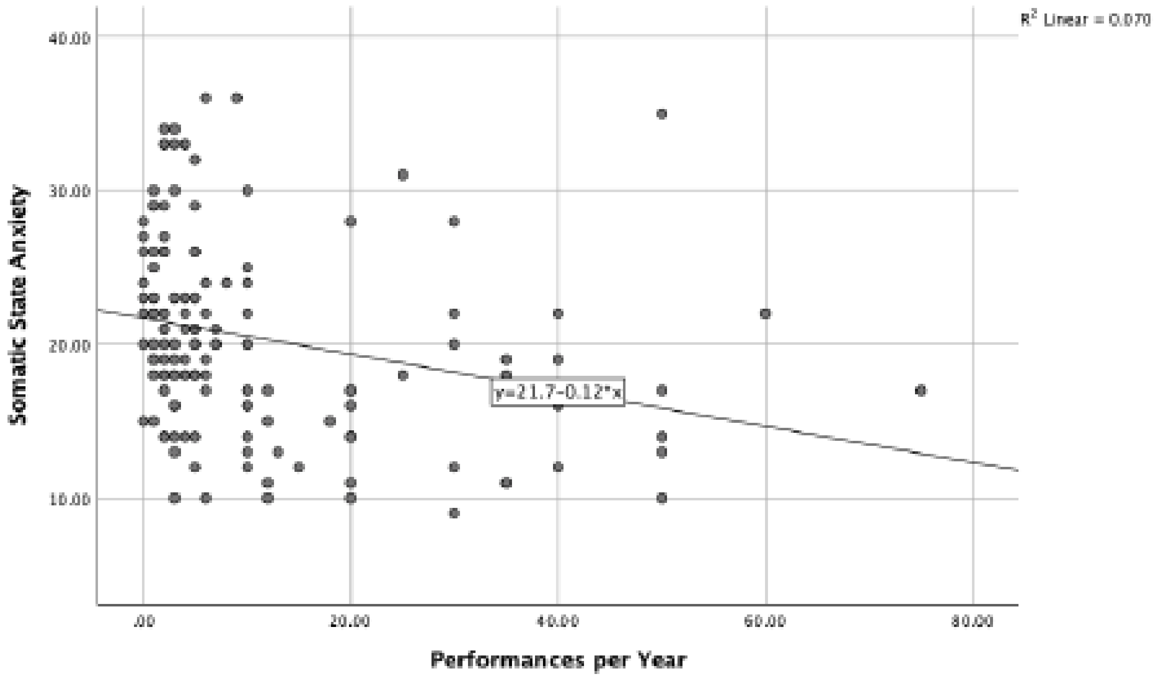


Figure 3.26: Relationship between Self-confidence and Age

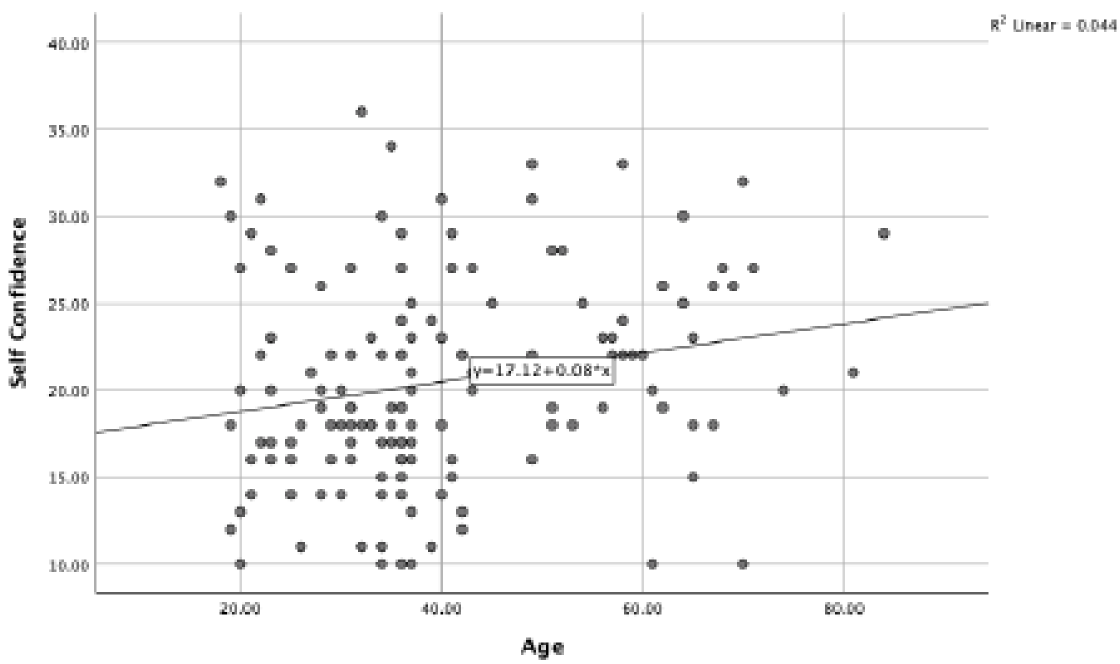


Figure 3.27: Relationship between Self-confidence and Years of Playing Piano

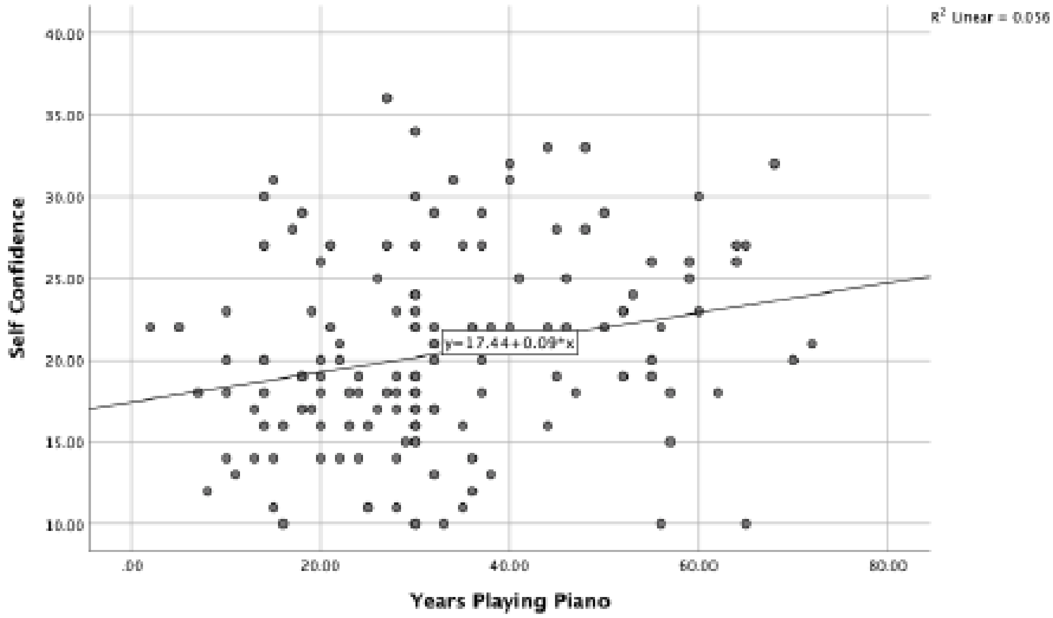


Table 3.17 shows a Pearson's correlation between the Competitive State Anxiety Inventory-2 and memory lapses variables. All CSAI-2 questions were significantly correlated with all memory lapses questions. The high level of correlation was between frequency memory lapses and self-confidence. Also, cognitive anxiety highly correlated with frequency of memory lapses. Figures 3.28-32 indicate the scatterplots to show the direction of a significant relationship between CSAI-2 and memory lapses variables.

Table 3.17: Pearson's Correlation Coefficients between CSAI-2 and Memory Lapses Variables

		Cognitive Anxiety	Somatic Anxiety	Self-Confidence
Memorizing Ability	Pearson Correlation	-.357**	-.309**	.349**
	Sig. (2-tailed)	.000	.000	.000
Freq of Memory Lapses	Pearson Correlation	.412**	.366**	-.418**
	Sig. (2-tailed)	.000	.000	.000
Impact of memory on performance Quality	Pearson Correlation	-.281**	-.227**	.293**
	Sig. (2-tailed)	.001	.007	.000

** Correlation is significant at the 0.01 level. * Correlation is significant at the 0.05 level.

Figure 3.28: Relationship between Cognitive Anxiety and Frequency of Memory Lapses

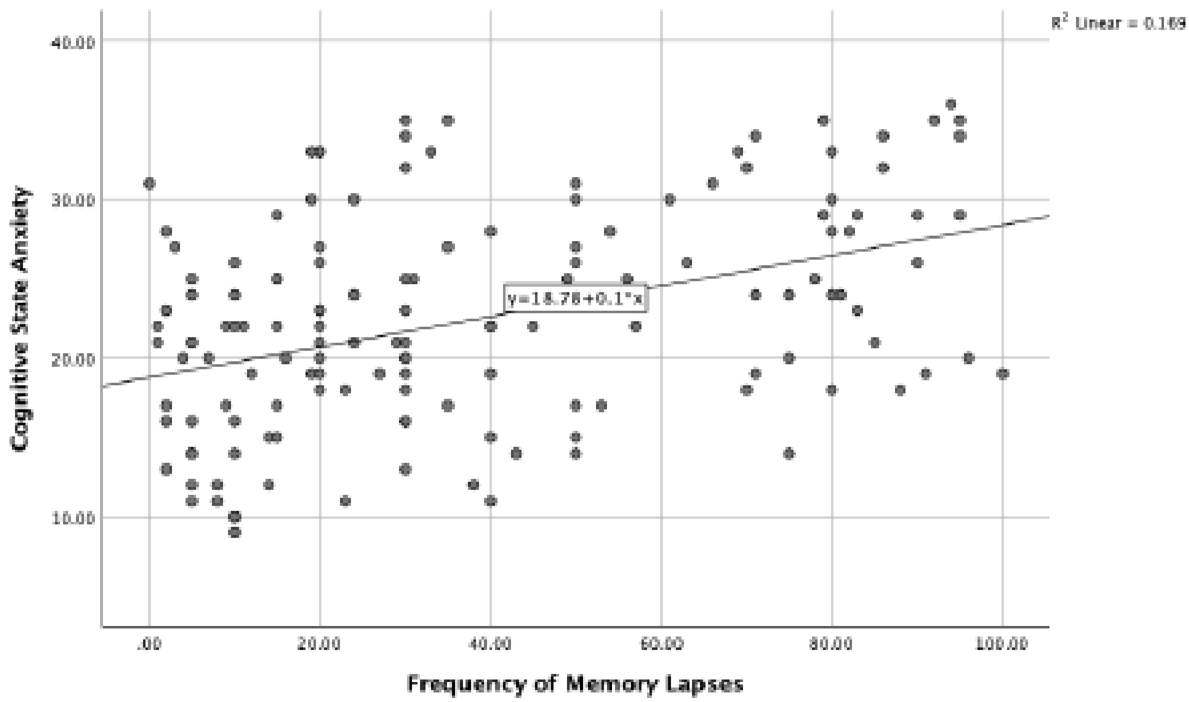


Figure 3.29: Relationship between Somatic Anxiety and Memorizing Ability

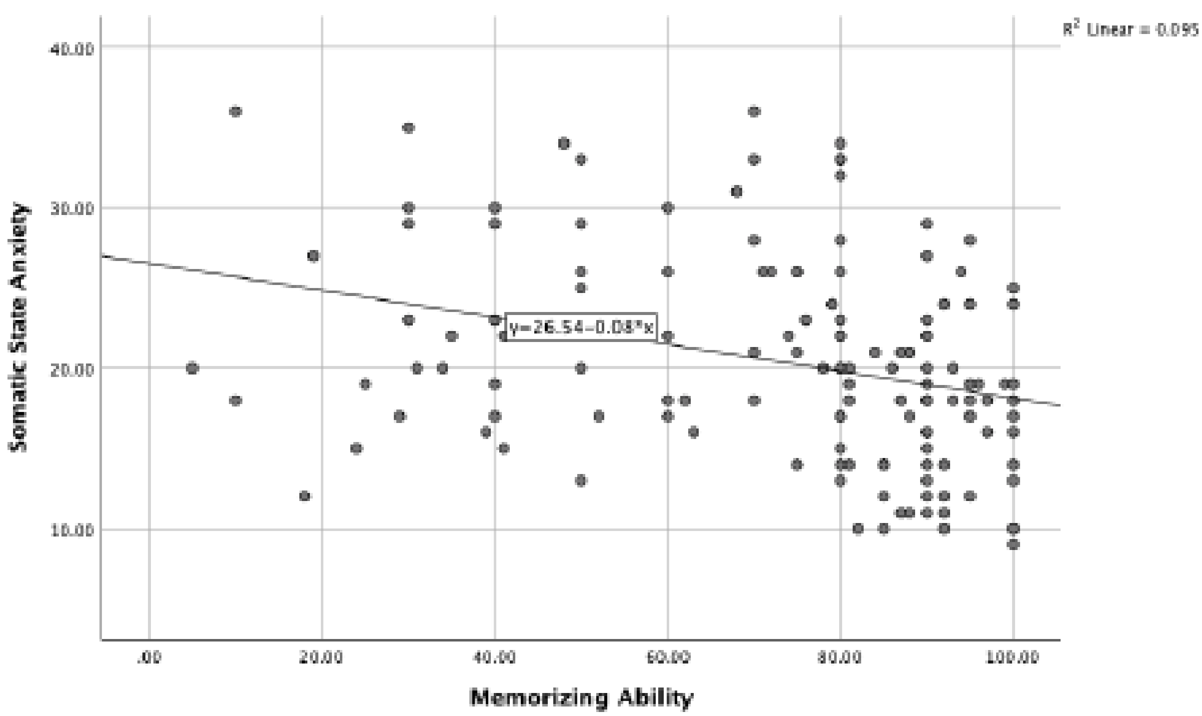


Figure 3.30: Relationship between Somatic Anxiety and Frequency of Memory Lapses

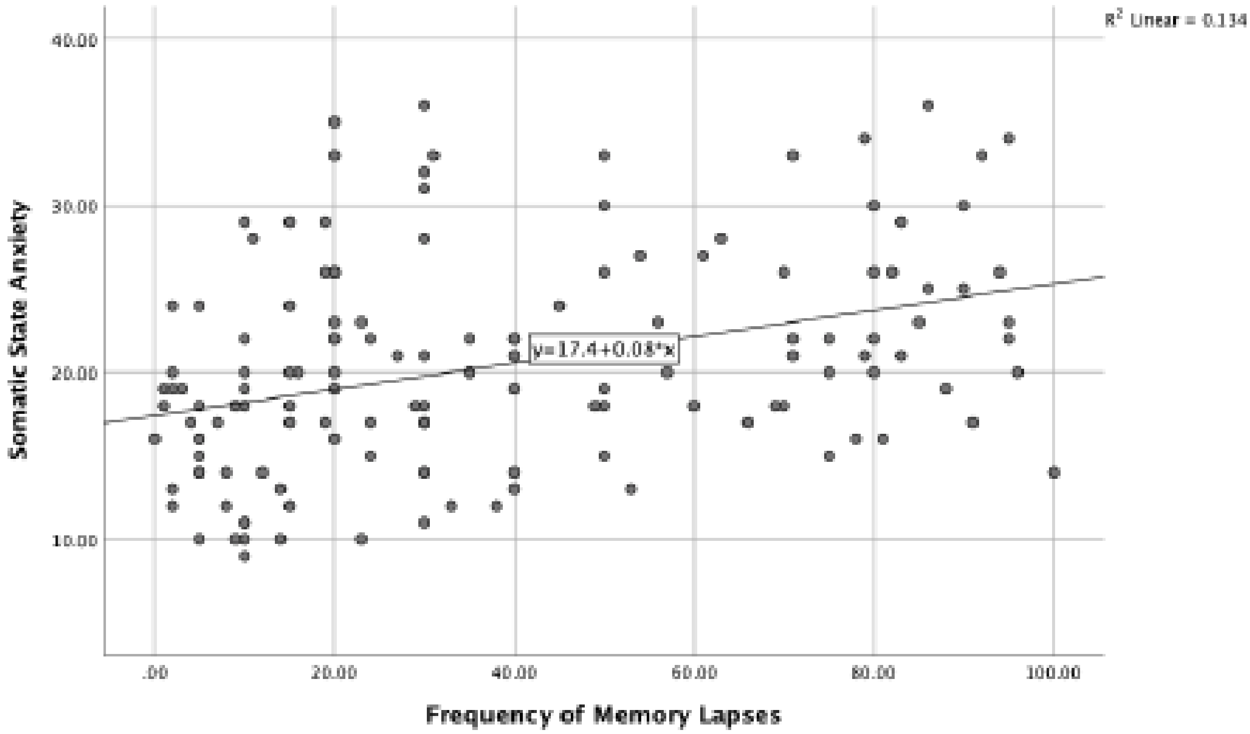


Figure 3.31: Relationship between Self-Confidence and Frequency of Memory Lapses

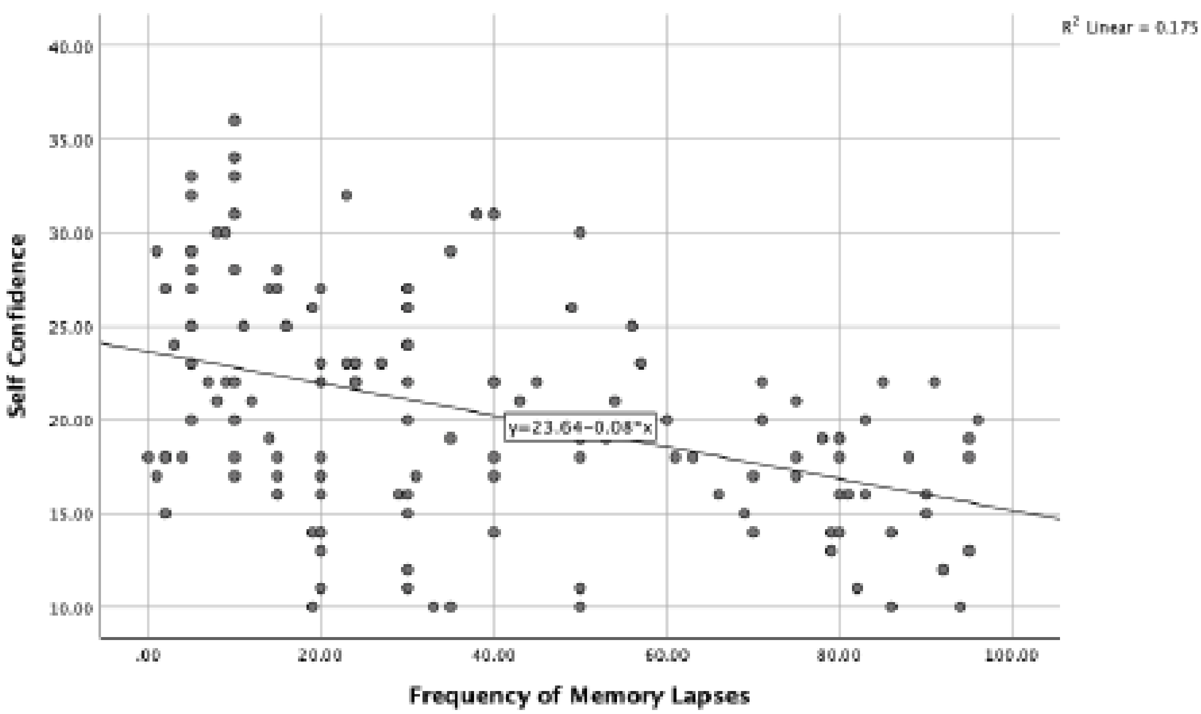


Figure 3.32: Relationship between Self-Confidence and Impact of Memory on Performance Quality

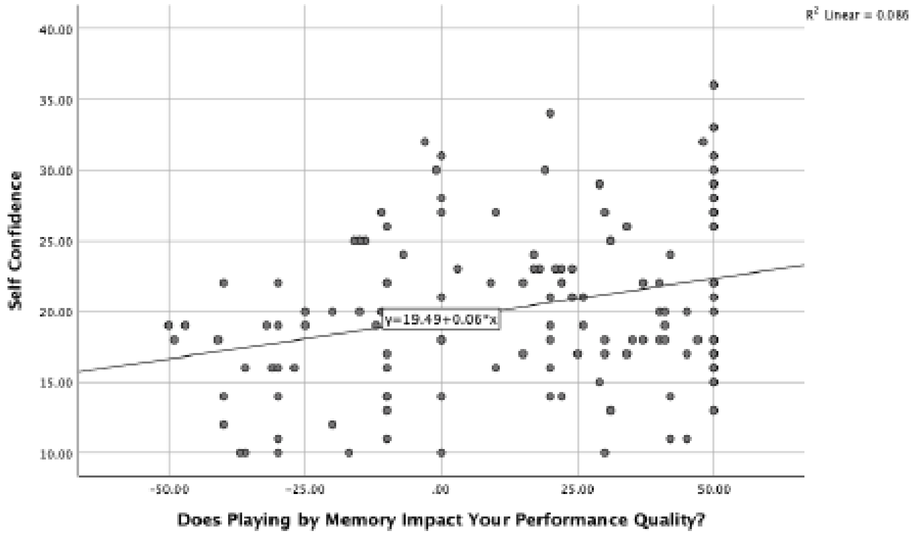


Table 3.18 shows a Pearson's correlation between the scoring of Competitive State Anxiety Inventory-2 and familiarity with memory strategies – that most of the memory strategies significantly correlated with cognitive anxiety and somatic anxiety negatively, which means less familiarity of memory systems indicated more cognitive and somatic anxiety levels. In contrast, a high number of familiarities of visual memory, auditory memory, and linguistic memory significantly correlated with more self-confidence. Figures 3. 33-35 indicate the scatterplots to show the direction of a noticeable significant relationship between CSAI-2 and familiarity of memory strategies.

Table 3.18: Pearson's Correlation Coefficients between CSAI-2 and Familiarity of Memory Strategies

		Cognitive Anxiety	Somatic Anxiety	Self-Confidence
Familiar with Motor Memory	Pearson Correlation	-.111	-.186*	.154
	Sig. (2-tailed)	.192	.030	.071
Familiar with Visual Memory	Pearson Correlation	-.265**	-.305**	.278**
	Sig. (2-tailed)	.002	.000	.001
Familiar with Auditory Memory	Pearson Correlation	-.285**	-.292**	.190*
	Sig. (2-tailed)	.001	.000	.025

(table continues)

		Cognitive Anxiety	Somatic Anxiety	Self-Confidence
Familiar with Linguistic Memory		-.316**	-.187*	.189*
		.000	.043	.040
Familiar with Emotional Memory		-.225*	-.150	.151
		.011	.097	.096
Familiar with Structural Memory		-.243**	-.281**	.160
		.004	.001	.061

** Correlation is significant at the 0.01 level. * Correlation is significant at the 0.05 level.

Figure 3.33: Relationship between Cognitive Anxiety and Familiar with Linguistic Memory

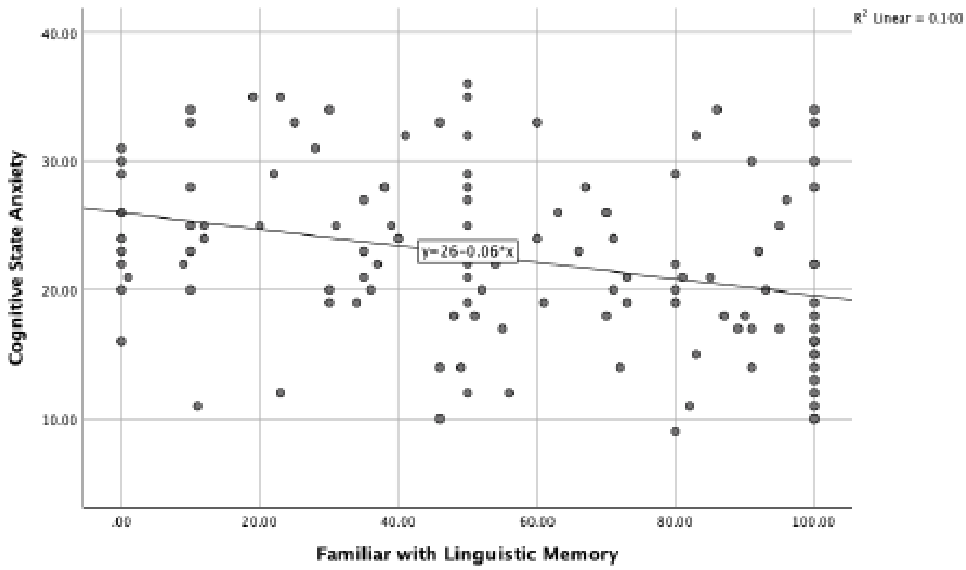


Figure 3.34: Relationship between Somatic Anxiety and Familiar with Visual Memory

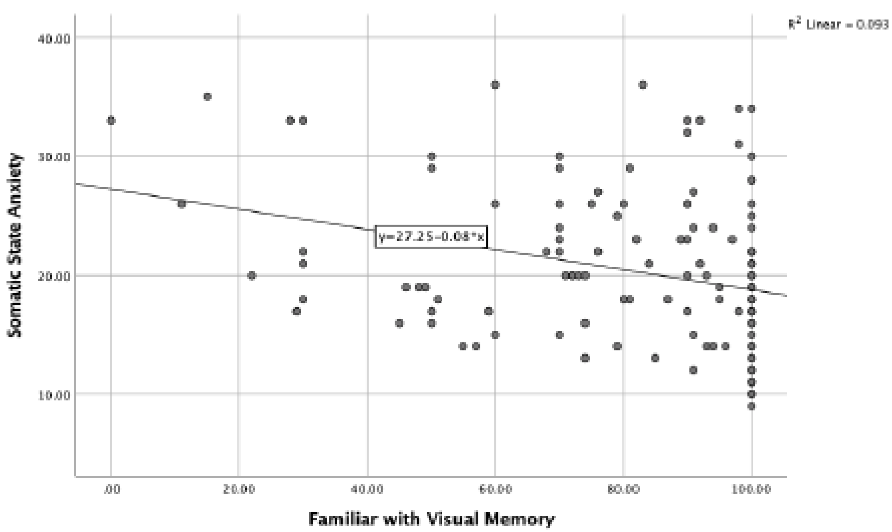


Figure 3.35: Relationship between Self-Confidence and Familiar with Visual Memory

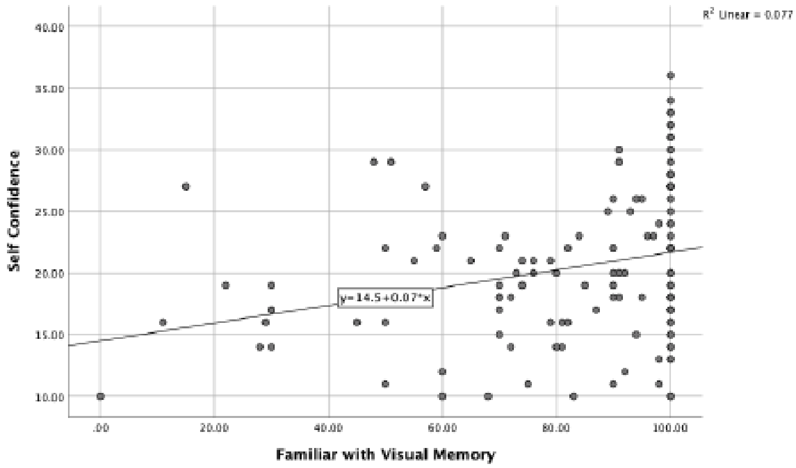


Table 3.19 shows a Pearson's correlation between the scoring of Competitive State Anxiety Inventory-2 and frequency of using memory strategies. Several memory strategies – auditory memory, linguistic memory, and structural memory – significantly correlated with cognitive anxiety and somatic anxiety. In contrast, there was no relationship between self-confidence and memory strategies. Figures 3.36-38 shows the scatterplots to indicate the direction of a noticeable significant relationship between CSAI-2 and frequency of using memory strategies.

Table 3.19: Pearson's Correlation Coefficients between CSAI-2 and Frequency of Using Memory Strategies

		Cognitive Anxiety	Somatic Anxiety	Self-Confidence
Frequency of Using Motor Memory	Pearson Correlation	.010	.032	.039
	Sig. (2-tailed)	.904	.713	.655
Frequency of Using Visual Memory	Pearson Correlation	-.119	-.098	.114
	Sig. (2-tailed)	.167	.258	.188
Frequency of Using Auditory Memory	Pearson Correlation	-.189*	-.220*	.081
	Sig. (2-tailed)	.026	.010	.348
Frequency of Using Linguistic Memory	Pearson Correlation	-.324**	-.210*	.187
	Sig. (2-tailed)	.001	.034	.062

(table continues)

		Cognitive Anxiety	Somatic Anxiety	Self-Confidence
Frequency of Using Emotional Memory	Pearson Correlation	-.132	-.177	.018
	Sig. (2-tailed)	.161	.059	.853
Frequency of Using Structural Memory	Pearson Correlation	-.246**	-.283**	.157
	Sig. (2-tailed)	.004	.001	.070

** Correlation is significant at the 0.01 level. * Correlation is significant at the 0.05 level.

Figure 3.36: Relationship between Cognitive Anxiety and Frequency of Using Linguistic Memory

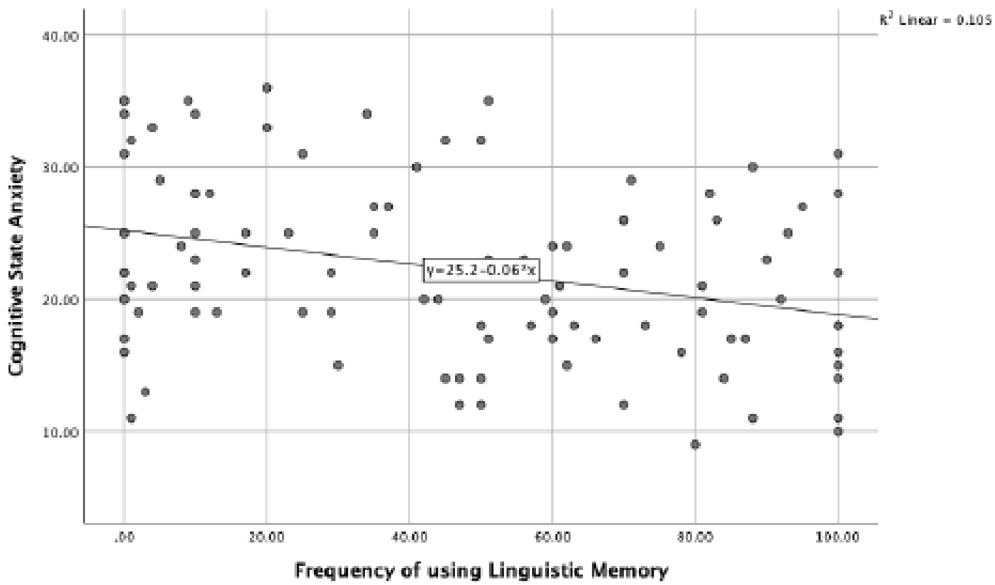


Figure 3.37: Relationship between Cognitive Anxiety and Frequency of Using Structural Memory

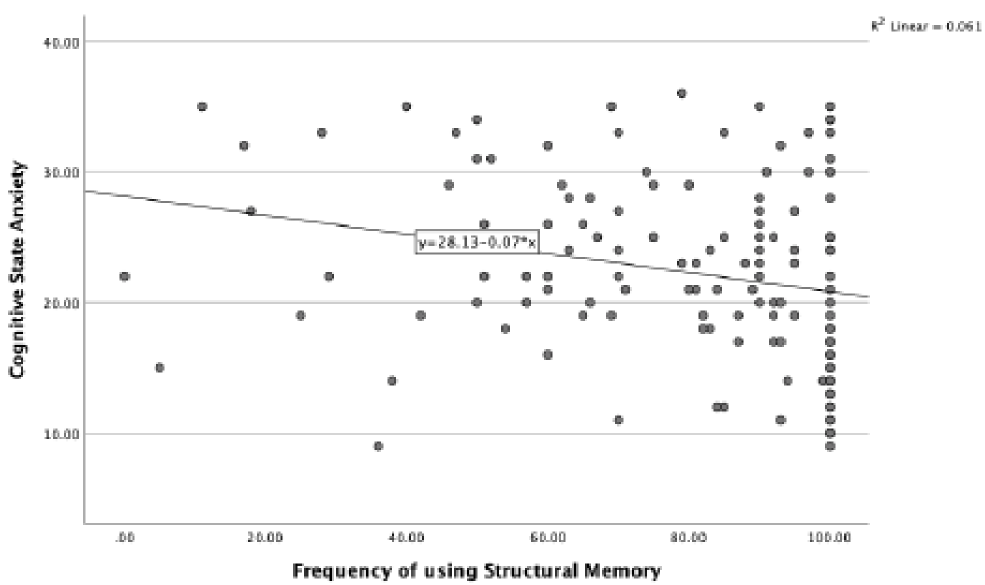


Figure 3.38: Relationship between Somatic Anxiety and Frequency of Using Structural Memory

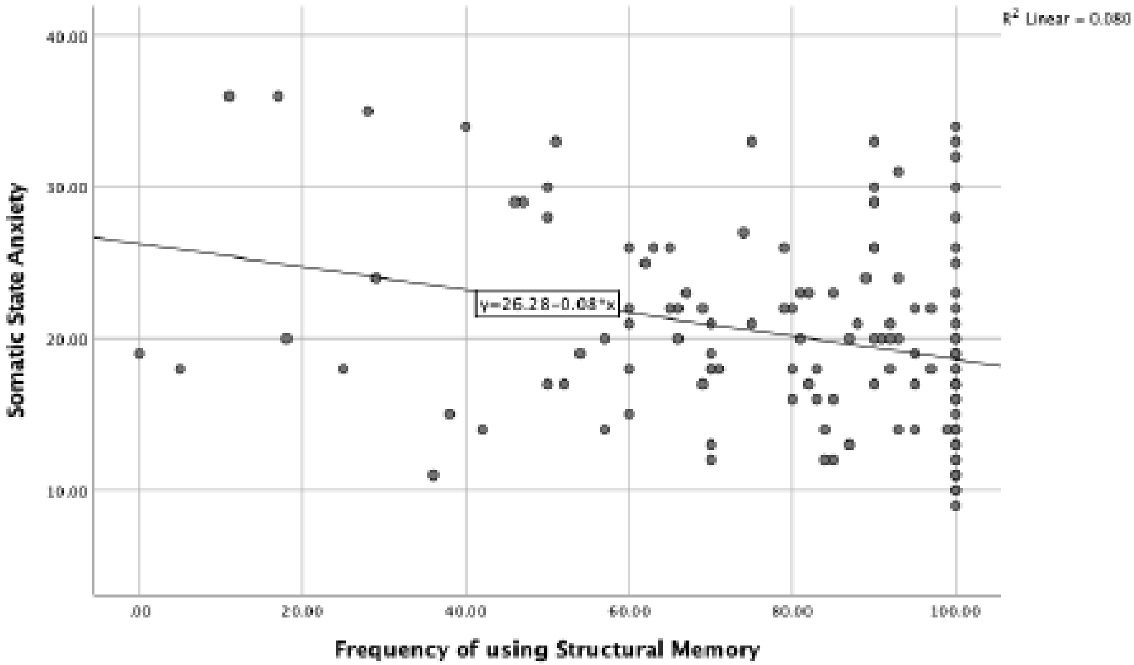


Table 3.20 shows a Pearson's correlation between the scoring of Competitive State Anxiety Inventory-2 and performance anxiety variables – that all CSAI-2 variables significantly correlated with all performance anxiety questions. Figures 3. 39-41 indicate the scatterplots to show the direction of a noticeable significant relationship between CSAI-2 and performance anxiety variables.

Table 3.20: Pearson's Correlation Coefficients between CSAI-2 and Performance Anxiety Variables

		Cognitive Anxiety	Somatic Anxiety	Self-Confidence
Frequency of PA	Pearson Correlation	.538**	.624**	-.528**
	Sig. (2-tailed)	.000	.000	.000
Impact of PA on Performance Quality	Pearson Correlation	-.351**	-.211*	.293**
	Sig. (2-tailed)	.000	.013	.000
Influence of PA on Performance by Memory	Pearson Correlation	.541**	.449**	-.504**
	Sig. (2-tailed)	.000	.000	.000

** Correlation is significant at the 0.01 level. * Correlation is significant at the 0.05 level.

Figure 3.39: Relationship between Cognitive Anxiety and Frequency of Performance Anxiety

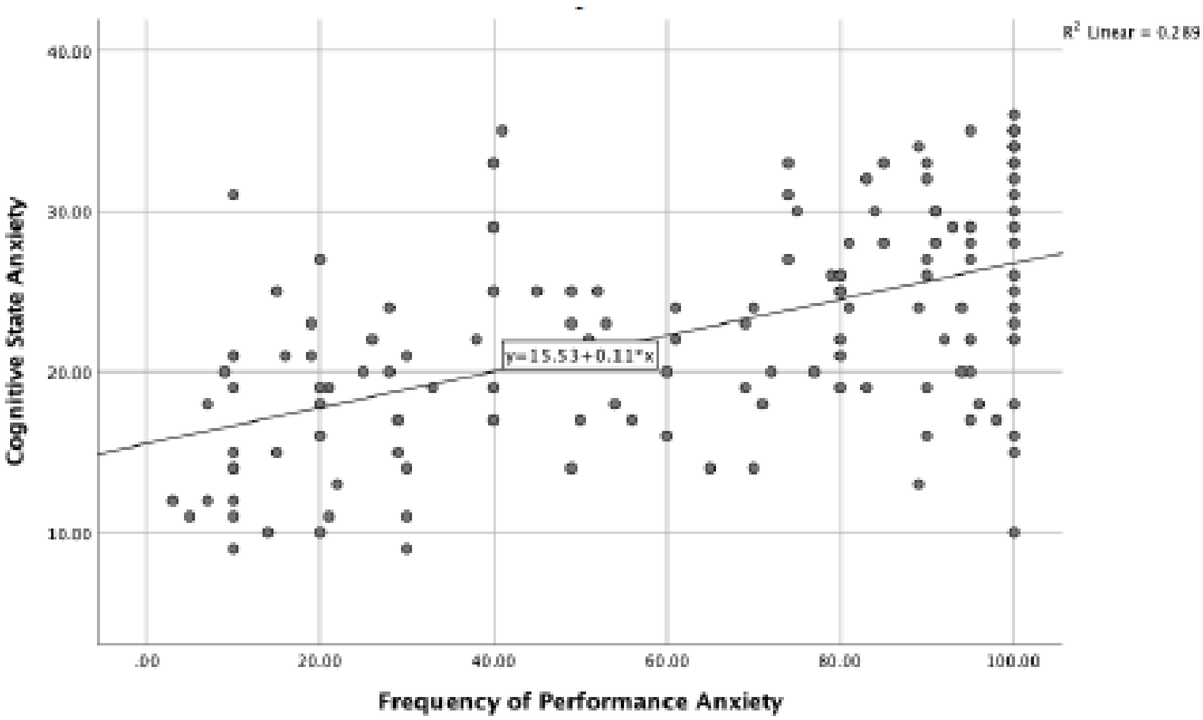


Figure 3.40: Relationship between Somatic Anxiety and Frequency of Performance Anxiety

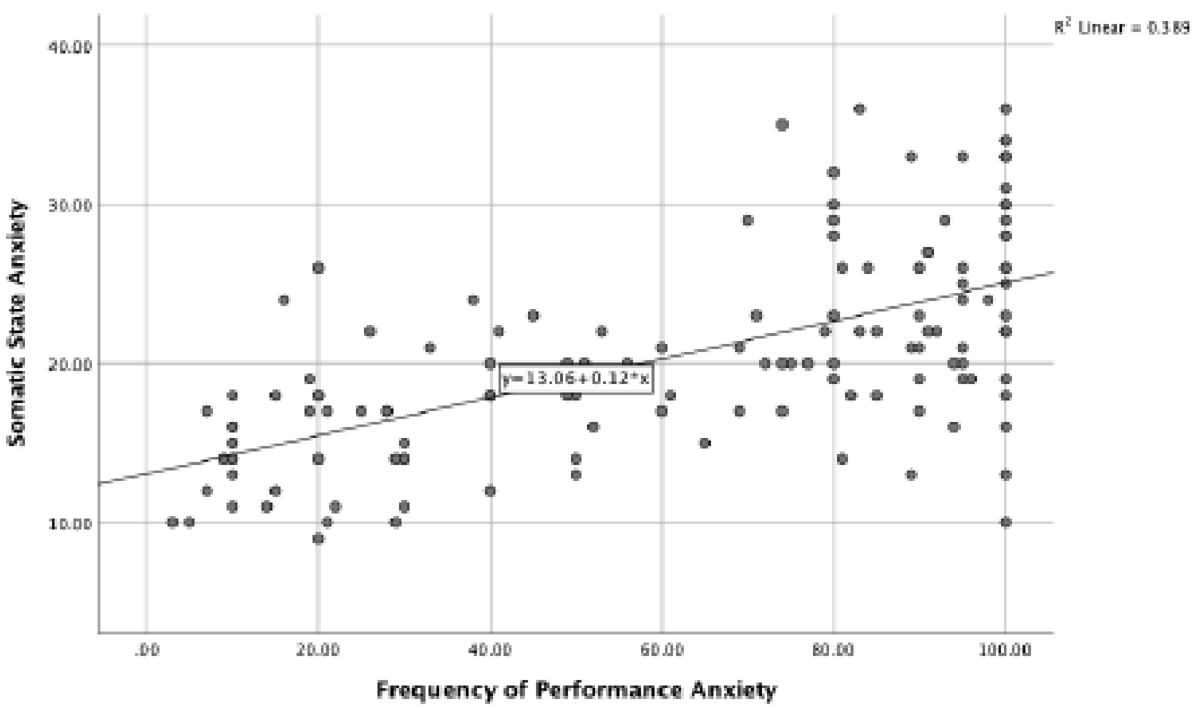
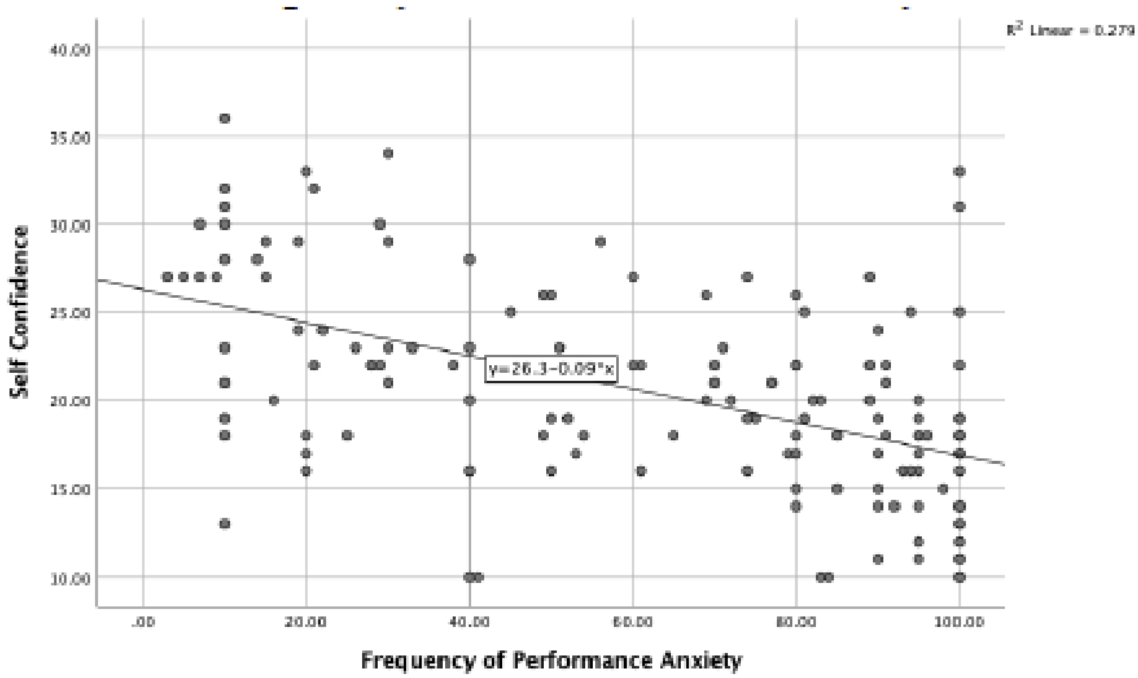


Figure 3.41: Relationship between Self-Confidence and Frequency of Performance Anxiety



3.10 Qualitative Analysis of Memory Lapses

There were two short statement questions: “Describe how having to memorize impacts you as a pianist” and “What do you do when you experience memory lapses during public performance?” One hundred and six participants responded to the first question, and one hundred and twenty-four replied to the second question.

The respondents replied to the first question with different descriptions. For analysis reasons, the responses were divided into three groups. Among the responses, the positive answers such as freedom and concentration were the most repeated responses (n = 50) and the negative responses such as anxiety and stress were the second-highest replies (n = 43). Also, thirteen respondents illustrated both positive and negative reasons, and other responses (n = 13)

As shown in Table 3.21, there were similar words/phrases related to freedom and concentration. These respondents expressed having to memorize as a pianist promoted the internalization of the aspects of music and otherwise. Also, they learn the music better, and it liberates them from the score in performance. Under negative responses, Table 3.21 shows the next frequent responses related to stress and anxiety. A high number of the respondents also expressed having to memorize leads to less learning a new repertoire or having a recital. There were also thirteen answers that mentioned both positive and negative reasons and others in Table 3.21.

Table 3.21: Comments Related to Impact of Memorization

Positive
Being able to play with a lot more freedom and spontaneity.
I play more freely when the piece is memorized.
I can concentrate better on the music and expressions.
Memorization provokes you to study the text more in-depth. Physically, one is freer when not needing to look at the score.
Memorizing forces me to internalize the notes and frees up my mind to focus on the more musical aspects of a piece.
Encourage me to know the music as well as possibly ("by heart"), which increases musicality and emotional connection.
Forces me to learn notes quicker, forces me to focus on technique and emotion rather than just notes.
Playing by memory allows me to be able to express what's in the piece. Because oftentimes, when my eyes are stuck on the paper my playing becomes very mechanical, meaning less phrases
Generally, I think it's better to play from memory and have everything internalized so you can really focus on what you're doing and actually listen to yourself playing.
I like playing from memory because I feel that I am at my closest with the music, and can better relate to the audience.
I internalize the music more strongly and I perform with more freedom and spontaneity.
I am freer when performing because I have everything internalized and I don't need "help" with the score outside me.
I can perform freely by memory, and express my musical ideas easily.
With the memory, I can more focus on my playing musically. I could listen to my sound well and express better! Also, the music flows much smoother.
Security allows me to concentrate on the meaning of the music with freedom.
It requires me to understand my music on a much deeper level and helps me to focus on the emotional and physical elements of the music over the notes.
It requires me to interact with the music on a different and often deeper level.

(table continues)

Positive (con't.)
Memorizing a piece requires lots of practice and it gives a more thorough understanding of a piece.
It forces me to dig deeper into the piece and understand it much more thoroughly.
More concentrate on playing itself, and draw imagination largely.
Negative
Increases stress before initial performances.
Limits amount of new repertoire I can get ready; thus, fewer recitals.
Time required to memorize; anxiety has increased slightly with age.
Playing from memory greatly increases the intensity of my nerves and consequently results in motor slip-ups and memory lapses. Also, having to memorize copious amounts of music in a short amount of time intensifies stress levels in a negative way.
I may play better with the score in front of me, but hate page-turning or having a page-turner.
It makes everything about performance exponentially more stressful.
It's not easy for me. Often makes me feel less than compared to my fellow pianists. I feel like I can't perform because memorization has always been hard.
To perform from memory, I have to prepare significantly more than if I am performing with a score (using all of the techniques outlined in your research).
It makes me nervous/worry/tremble/lose control and confidence.
Takes a lot of time and limits the amount of repertoire I learn. Also creates stress and pressure.
Spend more time memorizing music rather than making another musical expression.
Getting stressed to have a recital on the stage by memorizing and experiencing insomnia before the performance.
Less willing to take risks, an expectation of memory makes me less likely to want to perform.
It adds another layer of tension.
I hate it and it's unnecessary but required.
Memory slip can lead to more anxiety-causing muscular issues and increase stage fright.
I'm afraid of memory lapses or mistakes, and it becomes a huge burden. This leads to play fewer solo recitals than when I was young. I am hesitant to accept concerto performance opportunities.
It makes me stressful and nervous.
Other
It is a bit scary, considering the fact that you are relying only on your memory. However, it allows for more expression in my experience.
It requires a new depth of knowledge of the piece which is good but also makes it more difficult.
Depends on the piece: with some pieces it's a positive factor, with others can be negative.
Never had issues.

(table continues)

Other (con't.)
Not sure I agree with the "having to memorize" statement. I (and I encourage my students to) "CHOOSE" to memorize.

Having to memorize a piece of music just adds another factor into the steps taken when learning a piece. With memorization, it is no longer just reading notes or knowing the melody; we have to know the 110% of the piece, like the back of our hand. Because of this, having to memorize pieces adds another level of stress when going into performance situations. Sometimes it is also difficult to focus on the strategies for memory that we planned ahead of time when faced with the nervousness associated with performance.
Mostly I have a secure memory, since I was a child learning piano, I never failed in the piano lessons or competitions so I won many competitions, but after growing up, I tend to get more nervous so sometimes there is a memory lapse in performance, but not often. I think that also depends on how much you've practiced and how much work you've done.
It can be a nuisance because it's time-consuming, and, if you read well, it isn't always particularly necessary.

The second qualitative question asked the subject about the experience of memory lapses while they are performing publicly. Memory lapses have mostly happened unexpectedly so some people might prepare a back-up plan just in case while others do not. For analysis reasons, the answers were categorized into four groups: the phrase "Keep Going/Playing" was the most frequent response (n = 70), and the phrase "Go Back" and/or "Improvise" were the second-highest replies (n = 28). Also, seventeen subjects answered with other experiences (n = 17) and eight participants answered with the phrase "Back-up Spot" (n = 9).

As shown in Table 3.22, most of the respondents answered: "Keep Going/Playing." The performer definitely keeps playing – either jumping to the next part or going back to the previous section; related phrases "Go Back" and/or "Improvise" are also shown. Table 3.22 also shows other comments about experiencing memory lapses in performances that related less memory lapse experiences or not to play from memory in public. Lastly, Table 3.22 show few answered preparing back-up spots; instead they created a plan to prevent memory lapses while having public performances.

Table 3.22: Comments Related to Memory Lapse Experiences

“Keep Going/Playing”
Just move on
Keep playing
Skip the part and keep playing
Find a way to keep going. I worry more about how the communication is interrupted. I do not worry too much about what the audience thinks.
I usually try to keep going and forget that it happened. But what usually ends up happening is I make an involuntary grunt/snort/other gross noise and smile a little.
A variety of things, but usually keep playing my aural memory usually gives me enough information to “fake” until I’m back on track.
I keep playing. Sometimes have to skip, but I never give up. My memory lapses have never been so bad that I can’t finish.
Keep going, and try not to show anything in my face or general demeanor. Moving forward, try my best not to think back on the memory slip and how bad it was or if anyone in the audience noticed, etc.
Just keep playing whatever inappropriate harmonies then try to find the right spot to continue the music.
First, calm the mind to avoid making matters worse. Second, attempt to catch the musical texture I inherently flubbed up. Third, as a last resort, keep playing to the closest musical section. Finally, let go of what just happened to retain composure.
Just keep going. For the most part, my memory lapses are small ones that I can get through fairly quickly and somewhat smoothly, so I usually just muddle through until finding my place.
I continue playing, I most likely skip the section but I try to make it sound smooth.
Keep going: relentless practice so I know it so well I can jump ahead.
Push through. Do not stop. This is where structural memory and theory provide a solution foundation.
Keep going and try not to let the mind linger on what happened
I try to keep going on without losing the pulse. If I cannot remember what it was, I try to make a cadence or just fake it.
Keep going, find a good spot to start the section without any pause.
“Go Back” and/or “Improvise”
Try to go back to the very beginning of the music, and restart it.
Playing again from some phrases before that part.
Able to recall instantly what “should” be taking place. Rarely need to “re-start” or “improvise.”
Depending on the piece, I’m fairly good at improvising in the style until I can get back to the real music again.
Cope the best I can. Usually, just go on, sometimes improvise badly.

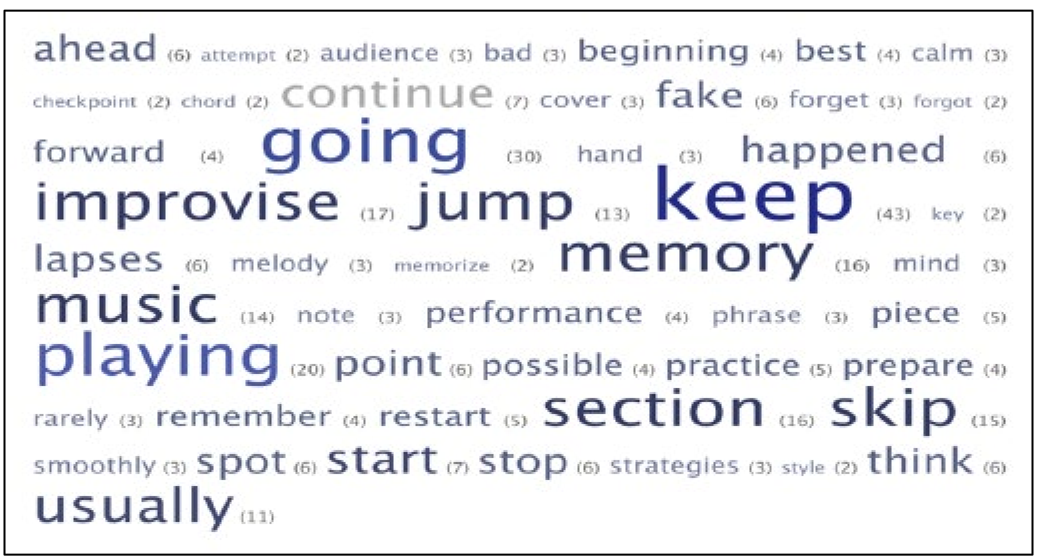
(table continues)

“Go Back” and/or “Improvise” (con’t.)
I would keep going improvising in the key and style that fits the piece until I recall my memory on the piece.
Repeat the previous section, move to a different section, improvise while trying to move on.
Just creating something and then go to the next part.
Other Responses
One usually forgets in one hand (more often the left), and one continues with the hand that remembers and hopes both rejoin as soon as possible.
I don’t play from memory in public.
I usually don’t have memory slips, but one time, I stopped, and told the audience that I needed music and performed with music.
Use all the strategies that I can handle to find the musical points.
I focus on audiating the melodic line or thinking about the chord progression.
I’ve experienced memory lapses only once in my life, which was like a one-page skip, but I did not even notice during the performance.
Having learned how to better prepare (and meditate!), I have lots of strategies for coping with this. For example, I practice starting anywhere and intense score study to prepare (preparing is key). Additionally, mindful meditation and breathing techniques help me to activate my parasympathetic nervous system. I also practice self-compassion which has helped me to make friends with my inner critic (who is no longer welcome on stage).
“Back-up Spot”
Calm, and re-start at the “start point” that I marked on my scores.
Go to the next starting point.
I try to always have “memory stations” in the music so that I can pick up somewhere and not flounder.
Jump to a “memory point” in the music.
Just skip to the next part (I always make the section when I practice, then I can start when I have a memory sleep).
When I used to perform from memory (I don’t anymore), I would move to the next “starting point.”
Move on, try to go forward until the end. I almost always have memory lapses, so I usually divide sections and memorize section by section, and if I really do not remember, I jump up to the later part.
Find a restarting place and finish the performance.

Besides the above qualitative data analysis, arranged by overlapping with the same words/phrases, there is also a web application, called TagCrowd, for displaying the word frequencies, invented by Daniel Steinbock.[40] TagCrowd shows the visualizing qualitative data analysis within one peek imagery. Large size words indicated the more frequent of participant's responses. Figure 3.42 and 3. 43 are the imagery of two questions, 1) describe how having to memorize impacts you as a pianist, 2) your experience of memory lapses during a public performance.

Figure 3.42: TagCrowd: Impact of Memorizing music as a Pianist

Figure 3.43: TagCrowd: Experience of Memory Lapses on Public Performances



[40] Daniel Steinbock, "TagCrowd," Accessed on April 5th, 2021, https://tagcrowd.com/

CHAPTER 4

DISCUSSION

The purpose of this study was to examine the relationship between memory strategies, performance anxiety, and memory lapses among classical pianists. The final usable cohort (*n* = 162) was assessed, showing a wide range of age groups, diverse ethnicity, education, and professional pianists participated in this study. The study compared and analyzed participants' awareness of memory strategies, memory lapses, and performance anxiety on diverse musical backgrounds. Based on the results of this study, 78.8% of participants earned a graduate-level degree; had thirty-three years of playing piano, thirteen hours practicing per week, and ten hours of teaching per week; and held eleven times of public performances per year on average. Thirteen pianists have more than thirty-six public performances per year. The data of respondents' musical background support and highly related with the awareness of memory strategies and memory lapses, including the participants who are older and have many years of playing the piano and were rated less frequency of memory lapses. In addition, the data indicated that higher knowledge and frequency of using the six memory strategies had less frequency of memory lapses.

Most of the respondents were familiar with and used the four memory strategies (motor memory, visual memory, auditory memory, and structural memory), but the linguistic memory data and the emotional memory data rated lower than above the four aforementioned memory strategies on average.

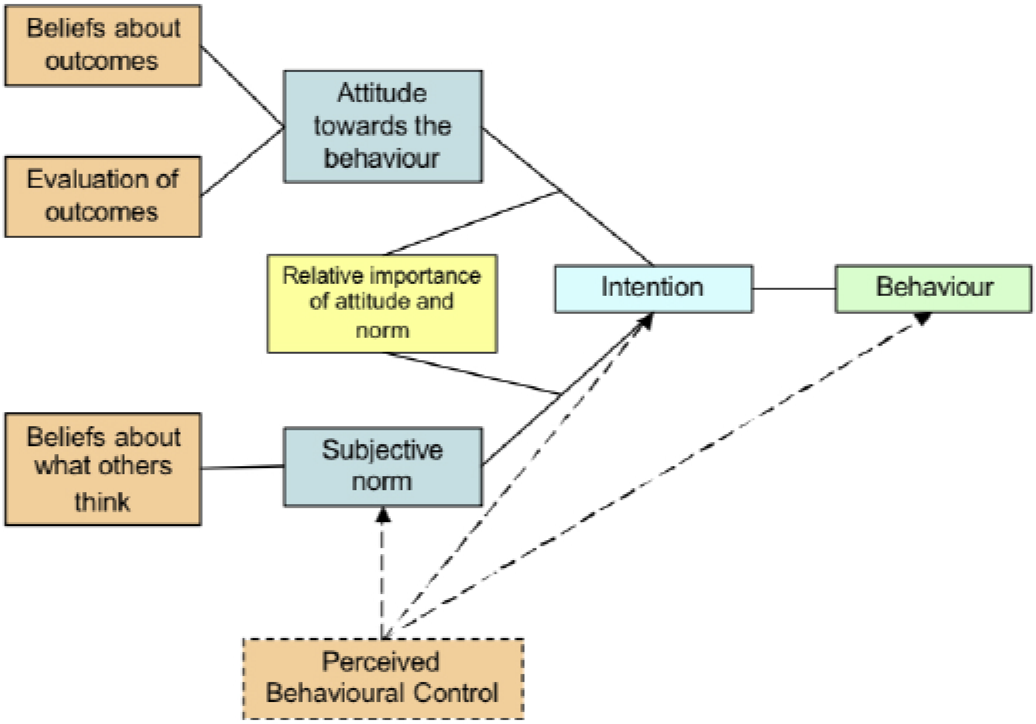
This study highlights the challenges connected with Competitive State Anxiety Inventory-2 (divided into three components: cognitive anxiety, somatic anxiety, and self-confidence), and promotes awareness of memory strategies, memory lapses, and performance anxiety – how multiple memory strategies could reduce cognitive anxiety and somatic anxiety. Cognitive anxiety and somatic anxiety significantly correlated with memory lapses and performance anxiety. Also, this study recognized that enhancing the use of linguistic memory could reduce cognitive anxiety and somatic anxiety.

Qualitative data showed the respondents' answers in experiencing memory lapses and the impact of memorizing as a pianist. A most of the pianists reported similar phrases "Go-back" or "Keep Going/Improvising." Eight pianists replied "Back-up spot" that may or may not highlight the solution of preventing memory lapses which supported by behavior theory. According to one psychology behavior theory, the theory of planned behaviour, there is a development of the theory of reasoned action and is one of the representative theories that explain the relationship between attitude and behavior.[41] The stages of the theory of planned behaviour's progression is displayed in Figure 4.1. The crux of this theory is the perceived sense of control over the behavior. The perceived sense of control over behavior is a subjective evaluation of how well one can actually perform and manage the action behavior and is intended to overcome the limitation that the intention of the behavior cannot describe the behavior due to situational limitations.[42] The discovery from this behavior theory may be applied to the technique of reducing memory lapses and in this pedagogical research area. Besides, the data from this study could be a reference for teachers, students, and professional performers as they work to prevent memory lapses and performance anxiety.

[41] Tim Jackson, *Motivating Sustainable Consumption: A Review of Evidence on Consumer Behaviour and Behaviour Change* (London: Policy Studies Institute, 2005), 48.

[42] Ibid., 49.

Figure 4.1: The Theory of Planned Behaviour[43]



This study has some limitations, including the instability of demographic characteristics (e.g. gender, ethnicity, and job status) and total sample size. The demographic data was derived from mostly female (since 68.5% of the entire respondents were female), and data represented 44.8% of White respondents and 48.5% of Asian respondents. Also, 46.7% of the overall respondents are currently teaching in college/university. In addition, due to the size of the overall sample, 162 respondents, this data is not representative of all piano players' knowledge.

Within these limitations, this research data gives a foundation for future research that multiple memory strategies, memory lapses, and performance anxiety are related to pianists' musical background and demographics. For future research, a larger sample data and diverse group of pianists need to be collected among pianists.

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[43] Jackson, *Motivating Sustainable Consumption: A Review of Evidence on Consumer Behaviour and Behaviour Change*, 48.

CHAPTER 5

CONCLUSION

There is a link between pianists experiencing memory lapse problems and having negative performance anxiety. This could be caused by personal/internal factors such as fear of performing on the public stage and the need for perfection or external factors such as stage lighting and noise, and no matter how well the pianists are prepared. For pianists, the requirement of performing from memory became the norm since Clara Schumann began to play by memory in 1837. Compared to musicians on other instruments, pianists' music scores are accompanied by an incomparable number of pages, so is impossible to turn pages while playing. Qualitative data showed that many pianists could focus on music more and more freely through memorization. Of course, there is also the advantage of being able to express music more freely through memorizing music, but there are situations where many pianists are stressed by memorization to such a degree that they may reconsider their major of choice. As shown by the data in this study, most pianists already used and were familiar with the four memory strategies (motor memory, visual memory, auditory memory, and structural memory), but the awareness and frequency of using the two other memory strategies (linguistic memory and emotional memory) is remarkably lower than other four listed memory strategies. In particular, the data show that pianists who rated high scores on cognitive anxiety or somatic anxiety suggest focusing on linguistic memory and emotional memory to decrease the level of anxiety they experience. For pianists who have frequent memory lapses while performing publicly, creating a back-up spot while practicing is a key intervention.

This study cannot be generalized all pianists' awareness of memorization or performance anxiety due to the limitation of participants. For future research, if more pianists' data will be collected, more stable and standardized results will be produced.

Finally, awareness of the link between memory lapses and performance anxiety needs to be considered. Promoting this awareness is just the start as we help pianists achieve better performances and reduce as much performance-related stress or anxiety as possible. We also cannot ignore the need for memorizing strategies like practicing and using muscle, auditory, and structural memory. And it is my belief, based on the research conducted and data gathered, that adding the use of linguistic and emotional memory would enhance what pianists can accomplish. Awareness and memory strategies combined can support pianists through specific problems, and it could also improve their ability to be swept away in the artistry of and within the music they play.[44]

[44] Barry Green and W. Timothy Gallwey, *The Inner Game of Music* (New York: Doubleday, 1986), 37-38.

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